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THE DRAFTSMAN

Robert W. Shelmire



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The Draftsman

BY
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Preface.

This book contains a message to draftsmen. Its aim is to show them the way by which it is possible to rise above seeming intolerable conditions,—conditions which have been imposed gradually though persistently for many years until draftsmen have come to realize that they are not getting a square deal.

The writer's viewpoint is obtained from the outside as well as the inside of the drafting-room and is based on years of experience, covering the greater part of the United States. His thought is not one of bitterness, rather is it one of determination to present the draftsman's case precisely as it exists, sparing none. That the evils of the drafting-room may be destroyed, it has seemed necessary to dwell at length upon them.

The critical reader must realize that the work is unique in that it is the only book written on the business or economic side of drafting; therefore the material is entirely original. A great amount of time has been spent on the study of the problems confronting the draftsman and a most careful search has been made to determine the underlying causes and their remedies. The effects every one is familiar with; it is primary causes we want uncovered. In every instance where unsatisfactory conditions are mentioned a remedy is given or suggested.

Thus in a spirit of helpfulness this book is dedicated to those men who are engaged in drafting, the finest, the noblest, the most tedious work there is. The men who designed and made the plans of the steel and concrete ships, the sub-chasers, airplanes, tanks,

battleships, cannon, machine guns and a thousand other things, all of which, to say the least, helped to perpetuate freedom on earth. They doubled over the drafting-board to beat the mad Hun at his own game of scientific warfare and they did it. They schemed, planned, invented and developed the engines of war and destruction but without any of the glory of seeing or helping them accomplish their victorious purpose. The praises of the draftsman have never been sung for they live and work in obscurity.

ROBERT W. SHELMIRE.

Chicago, May, 1919.

CHAPTER I.
THE KEY-NOTE.

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The substance of this book, in a word, is a plea for RECOGNITION of the draftsman. The key-note of recognition is ORGANIZATION. Without organization there will be no recognition.

Much to the shame of the engineering profession draftsmen in general are held in low esteem. It is hard to explain why this is so, since almost all engineers were formerly draftsmen and the draftsman of today is the engineer of tomorrow. The drafting-room is both the cradle and the workshop of the engineer and of all engineering projects. Engineers, many of them, have been raising themselves as it were by keeping the draftsmen down. Naturally draftsmen have become discontented; hence the prevailing and nationwide unrest in drafting-rooms.

The unrest must be quieted but it needs to be done scientifically. Furthermore it must be done in a true democratic spirit, and the attempt to define draftsman as something apart from engineer and engineering is not democratic. Germany has her classes of engineer employers and employees. Do we want this in America?

Draftsmen are forming unions. They have been driven to this by those who should be foremost in trying to uplift them. Draftsmen have themselves come to believe they are tradesmen, when in fact, they are no more so than are dentists, surgeons or teachers. This tendency to unionize is most serious because of the intimate knowledge draftsmen possess of all the plans, processes and patents upon which rest the very foundation of modern industry. Engineers, what are you doing to prevent it? Read this book and get the draftsman's viewpoint. Then let cooperation replace humiliation. Start at once an employees' representation plan in the drafting-room.

The managing of drafting-rooms must receive higher consideration. They are, generally speaking, run in a haphazard manner. If every drafting-room were to be carefully and scientifically conducted, sufficient saving would be effected to give draftsmen the one hun-

dred per cent increase to which I believe they are entitled. Moreover when engineers and draftsmen work together and control the operation and construction of all engineering works, to the exclusion of lawyers, doctors and politicians, untold millions will be saved the public.

The employment situation is one which reflects no credit on engineers and their societies. True the societies were not organized to furnish employment service, but does this excuse the members individually for not extending assistance to the younger men who are growing up in the profession and will succeed them? The exploitation of young engineer-draftsmen constitutes a most shameful chapter in the history of engineering. To refuse aid and to force these young men to seek the agencies was bad enough, but to find engineers operating and profiting thereby is a bitter experience which many have gone through.

Much of the responsibility for the draftsman's predicament is placed on the older engineers. Draftsmen are not free from blame however. They have remained all too willingly in a comatose state while the world around them has advanced in thought and action. Just as nations have learned that none can be free without assisting others to be free, so draftsmen too must realize that none can live to themselves and ignore the problems of society. Draftsmen must help other draftsmen. They must exercise the right of franchise, particularly concerning engineering matters. They must come out of themselves and mingle with other human beings. They must read technical magazines, keep up-to-date, and be alive.

Schools which teach drafting must give the students a better idea of the importance and dignity of the work of engineering, present the business side correctly, and cease the misleading advertisements. Thousands of young men are today being deluded with the idea that a demand exists for draftsmen at salaries of "\$35 to \$100 per week **to start.**" Every draftsman regretfully knows that \$35 per week was almost the maximum pay for men of experience before the war and that the average increase since then has no more than equalled the increase in living expenses. Draftsmen should exert themselves to put these dishonest schools out of business and not permit them to exploit the profession.

A word has been said about draftsmen's conventions to standardize drafting and working conditions. It will mean a tremendous saving when once this is done for there is a vast amount of energy wasted at present. Positions must be standardized so that draftsmen filling positions which require equal amount of training shall receive equal pay in all branches of engineering.

The chapter on patents contains information regarding proper procedure to protect an invention. The subject is important to all draftsmen and nowhere else is it given in such condensed form. Almost every one is grossly ignorant of the nature and value of a patent, and draftsmen, above all, should know more about them.

Finally—**organize**. With the existing societies if possible, but **ORGANIZE**. The union method is beneath the intelligence of draftsmen. Show the tradesman a better example of organization, one which fights for and demands only what is right. If salaries are too low, then prove that you are worth more. If working conditions are unsatisfactory or the management is poor, present your case properly to the highest officials. Workmen have rights which employers are now bound to respect. If drafting is not the most pleasant occupation, let's make it so. Remember, **drafting is engineering and draftsmen are engineers**.



CHAPTER II.

THE DRAFTSMAN AND HIS WORK.



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APPRENTICE SYSTEM. A generation ago drafting was considered a trade and in fact that is about all it was. Men became proficient in making drawings but it was largely mechanical or physical labor and did not include as much calculating or mental labor as the drafting of today. This being also the day of the apprentice, most mechanical plants required their apprentices to spend some months in the drafting-room before becoming journeymen machinists. Then followed a similiar system of apprenticing young men in the drafting-rooms without requiring shop experience. This was a sad mistake. The draftsman who has never worked in a shop or on construction where he can see and feel his work go together, never makes a thoroughly experienced man. In those early days great importance was placed on learning a trade. Since drafting was considered the same as a trade, a beginner, whether he was an apprentice or not, received little or no pay during the first year or so. He was given expert instruction however, and became a good draftsman. The older men acted as teachers and task masters and were expected to tell the younger ones what to do and how to do it.

SCHOOL SYSTEMS. Times have changed since then. Now it is hard to find young men who have been well trained, because the engineering schools do not place sufficient importance on this work to give a good foundation on which to build a thorough draftsman. There is little system about this training in the colleges and schools and young men are turned out with various kinds of rules and methods instilled into them by teachers who many times have themselves only a superficial knowledge of the art.

For this reason the correspondence and night schools have been able to fill a need since their students are mainly ambitious young fellows who plug along until they develop into very good draftsmen. They are able to earn a small wage from the beginning which makes them even more desirable than college men, because the latter, hav-

ing been taught to consider drafting menial work (a most contemptible attitude) do not accomplish as much. Just how much time to devote to drafting in college is a problem for educators to decide, but to teach a student, or even to permit him to leave college, with the idea that drafting is lowly work and beneath the college man is all wrong. It makes him a snob and every true American hates a snob. If a correspondence school student makes a better workman it is because he is not handicapped in this way and is willing to work and learn.

THE ART OF DRAFTING. Drafting has become a highly developed art, yet we are not dealing with the artist draftsman and only to a certain extent with the architectural draftsman but more particularly with the men now known as engineering draftsmen. The foundation of this work is of course plain mechanical drawing. The development proceeds into the higher work of calculating and designing in connection with the drawing.

There are various branches of drafting work, each highly specialized and requiring special study for each one, except of course, for the fundamentals of drawing, which remain the same. The work of a structural draftsman differs greatly from that of a machine draftsman and from the others as well. However all lines of drafting overlap and there is no distinct separation between them. For instance a ship built of steel requires considerable work from the structural draftsman. All ships require machine drafting also. Railroad construction requires a particular type of training for draftsmen which is sometimes called civil engineering drafting, meaning almost anything but nothing definite. It includes the drawing of maps, grade profiles, bridges, buildings and plans of all conditions of railroad building from sea coast to mountains, under the head of Maintenance and Construction. In the Motive Power department plans are made for engines, cars and all mechanical equipment of the railroads. In the Signal department plans of signal layouts, electrical equipment and all such work are drawn.

The work in all lines of drafting requires infinite patience. Particularly is this true where much lettering is to be done, as on maps, etc., and also in machine drafting which requires great detail. Machine drafting or as it is usually called, mechanical drafting, requires

the most exacting work. A man may actually spend months on one drawing of a complicated machine. Structural drafting, which includes the drafting for all steel and concrete structures, is probably the most complicated, that is to say, when it is complicated at all, because the draftsman must visualize the connections of the steel members and the structure as a whole and at the same time do a great deal of calculating as the drawing proceeds. The calculations nearly always require trigonometry and sometimes the most complex mathematical formulae. To draw skewed connections of steel work requires an intimate knowledge of descriptive geometry. In mining work the underground surveys have to be plotted accurately on maps in order to tell just where the workings are and to see that they are within the property lines.

Every draftsman should be familiar with two or three branches of the work and have sufficient experience to enable him to take a position in any one of them. It may not always be possible, but it is a great protection, for if work becomes slack in one branch, a man, thus prepared, has the advantage of knowing how to do something else. In the same way construction men who have been through the drafting-room are able to save themselves a loss if they can obtain drafting work in the winter or at other times when they can not work outside. Dull periods often occur in all branches of engineering and necessitate frequent changes.

STANDARD PRACTICES. In all lines of drafting it is most important to know the system in the particular drafting-room in which you are working because there is no well established system in common use for the preparation of plans. That is, a drawing of a machine made in one plant does not conform to the practice of another shop and so it might be impossible to build it there. Certain branches of engineering have become standardized to some extent however. A structural steel product could be built in any structural plant, but every one has a different system of notation for their drawings which is not understood in another plant and is apt to cause confusion.

The reason there is so much chaos in the practice of drafting is because there is no association in which draftsmen get together to harmonize their work. They are eligible to membership in the big

national societies but the caste system practically bars them from taking any active part. In railroad work there has been some standardizing largely because of the interstate transportation system which necessitated the repairs of equipment on roads to which the equipment does not belong. Therefore the repair shops had to be able to build the same repair parts and work to uniform drawings. What uniformity there is to railroad drafting is due to the Master Car Builders' Association and the American Railway Engineering Association, but a great deal of "lost motion" yet exists on the railroads.

Standardizing for all drafting work is something which must eventually come about for the lack of system at present is causing an immense loss of time and money. The kind of efficiency or system which makes a draftsman a mere tooth of a cog-wheel in a great machine is however not the kind of efficiency desired. There should be a system of standards which does not require a draftsman to spend three or more months each time he goes to a new plant, learning to work on exactly the same kind of drawings to which he has been accustomed. Since it is necessary that draftsmen change their positions more or less frequently because of the fluctuating condition of engineering work, it should be made as easy as possible for one to start at a new plant without losing any of the efficacy acquired at a former place.

The solution of this question is draftsmen's conventions where they may thrash out their problems in detail. Companies should grant men the time and pay the expense of delegates to a convention for this purpose because it means to them an increase in the productive effort of the men. It costs several hundred dollars to break in a new man at almost any kind of work. Shop managers compile figures representing this cost on various lines of skilled labor. No set figure could be given for drafting in general, but somewhere between \$100 and \$1000 would cover almost any case. Of course when a draftsman changes from one line of work to another he has to learn the shop and office practice of that different line, which increases the cost of "breaking in." However this expense to companies would be greatly lessened if they would encourage their draftsmen to standardize their work throughout the country.

IMPORTANCE OF DRAFTING. Drafting has assumed a very important position in the engineering field, not to mention the entire field of industry. It also represents a very considerable part of the cost of engineering work. Occasionally the drawings cost much more than they should, as the result of various conditions. Possibly politics enters into the situation and the cost is not a consideration, or perhaps it is lack of system or poor management. There may be no check on the work and no one knows, for there is much drafting which is done carelessly and without proper supervision. Such drafting is a waste of time. If a drawing is of any value at all it must be correct and made in such a way as to reflect the intelligence of the engineer who plans and designs, so that every man who must work to that drawing has confidence in it and in the designer. "Cheap" drafting is expensive because some one always pays double in the end.

Every drawing represents some one's thoughts and ideas. These ideas are intended to meet requirements at hand and should be carried out in a drawing well made and accurate within reasonable bounds. It must be plain and every line for some purpose and all complicated details enlarged so that **no workman can go wrong**. Many draftsmen fail to realize that, when their drawings frequently come back from the shop for explanations, information is lacking. When a drawing is made correctly there is little speculation or argument about it. Every figure must be intelligible not only on the tracing but on the blue print. Remember a workman has to read it in the shop or an engineer in the field where they do not always have good light and it is frequently blurred by dirty or greasy hands.

The importance and value of drafting and the great responsibility often taken by draftsmen is not appreciated by the public nor does the engineering profession give proper credit where it is due. The value of work turned out by one draftsman will often run into millions of dollars per year. Doubtless he will not be entirely responsible: then again he may be. For instance, it was the draftsman who took a hastily drawn plan of a cantonment, sketched on the water and sewer pipes, calculated the proper sizes and within a few days the entire system was under order, amounting to hundreds of thousands of dollars. Does any one deny that this is engineering,

or that the draftsman has the right to call himself an engineer? Thousands of other draftsmen are **taking the responsibility** just as this man did, but they are not getting paid for it, nor are they recognized as engineers.

PRESENT STATUS OF THE DRAFTSMAN. To distinguish between a tracer, a detailer, a checker, or a designer is an impossibility. A tracer is sometimes a detailer; a detailer is always an embryo designer and sometimes a checker; a checker is one day checking and the next day designing and the designer may frequently be found tracing his own designs. There is only one line of distinction, and that is, or at least should be, between **the tracer who has the brains to become a detailer and the one who has not.** Practically every young man who enters the drafting-room is ambitious to advance step by step to what he considers better positions. If this situation is clearly understood it will be seen that if these young men are to learn the art of drafting thoroughly, they must begin at the bottom and learn it all. They must become tracers and learn to make plain lettering and ink a neat drawing. Where then does the "professional tracer" come in? Answer: He does not come in; he goes out. There is no place for him or for girls either who do not intend to progress beyond the mere mechanical work of making a tracing or even the very simple detail work. Girls, by the way, are entering the drafting-room and I do not mean to say they should not, — I would as soon try to induce the Mississippi River to run uphill. However I believe they should enter on the same terms as boys and receive equal pay for equivalent work.

In order to learn, the beginner must be instructed by competent men and acquire actual experience with the work himself. He must learn and advance, or his place given to some one who will. Since the so-called "professional tracers" are now doing work which is required of students if the latter are to learn properly, then the former should be eliminated from the drafting-room. Furthermore when tracers are paid nearly as much as experienced detailers, as is sometimes the case, this is always a source of discontent in an office. What incentive is there for a young man to go through college or to burn the midnight oil for several years and then find a tracer, a mere mechanical workman earning but a few dollars less than he does?

DRAFTING NOT A TRADE. It is obvious that drafting considered as a business is not a trade because the mechanical skill requisite is of minor importance when compared to the mental work required and actually used. Few realize this most important fact. It is evident that since drafting is not a trade it must be classed as a profession. If it is a profession it can scarcely be called the profession of drafting, for drafting is the foundation of the engineering profession. There is, therefore, only one other view to consider and that is to recognize that drafting is the engineering profession as much as any other work in engineering. This is the correct stand to take. Furthermore, the draftsman has the right to be called an engineer and to be a member of the engineering profession.

There are many welfare and business problems which must be solved by engineers and first of all is this one of definitions. The terms, engineer and draftsman, must be defined so that every one will know what is meant when the words are used.

Turn to the dictionary and you will find "profession" defined very plainly as "an occupation that involves a liberal education and mental rather than manual labor"; "engineering" as "the art of designing and constructing engines, public works, roads, etc., etc."; and "engineer" as "one engaged in engineering". Now this definition of engineer does not conform exactly to common practice, since it is frequently heard in a much more limited sense. However broad-minded engineers do not limit the terminology of the word; it is done in the class rooms. The public will never understand what an engineer is until engineers can agree among themselves upon a definition. As long as we consider only those who have progressed as far or farther than we ourselves as being engineers, and as long as we say of the others, "Oh, he is not an engineer," this agreement can never be brought about.

That there must be good and bad, competent and incompetent, engineers until human beings become infallible, seems never to be considered. When this familiar phrase, "He's not an engineer," is heard, the speaker is invariably passing judgment upon his fellow man and we are sufficiently warned of this folly two thousand years ago.

We must emphasize the distinction between the mechanic or engine runner and the engineer proper. Engineering is not a trade, nor the engineer an operator, but a mental worker, a designer, a builder, etc., and his work a profession. Common practice in engineering considers various kinds of technical men, including inspectors, teachers, efficiency experts, chemists, etc., as belonging to the engineering profession largely because they are not tradesmen and there is no other profession in which to classify them. Draftsmen, surveyors, etc., even rodmen and axemen, should also be included in the profession, provided they have the beginning of a technical education. Since they are in the profession they have the right to be called engineers. Why not let it be understood that they **are** engineers and end this hypocritical practice of trying to define who is and who is not an engineer? Engineers must broaden out, both in their definitions and vision. Every definition which narrows the terminology of "engineer" and engineering" is open to criticism and will not endure. The words, tracer, detailer, checker, designer and squad-boss, are words which help to cause the confusion and misunderstanding by the public and by engineers. In dentistry we do not talk of "tooth-pullers", "tooth-fillers", or "crowners", but there are men who do these things and nothing else. They are dentists. The public understands that the work of a dentist includes all such details but people do not understand what a checker or a designer does nor even that the work is connected with engineering. It is not necessary to use such words denoting the kind of work one does, either in or out of the drafting-room. If we want the public to understand our work then we should make it easier for them to understand. There is only one way so far as a business title goes and that is to use the word, engineer, and no other. Drafting as a business can not be divorced from engineering as a business.

In this book which pertains to the business end of drafting and the welfare of the draftsman, there is no mention of technical subjects or of proper methods of lettering, or of ways to hold the ruling pen, nor is any space taken with the old, familiar tables, all of which may be found in hundreds of other books. Draftsmen are tired of studying them; no doubt they want a change of diet and so this work is "designed" to answer the craving for something different.

CHAPTER III.
WORKING CONDITIONS.



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COMPARISON WITH OTHER WORK. The conditions under which draftsmen work are most unsatisfactory. The attitude seems to be to spend just as little money in this department as possible toward office furniture, space or salaries. The drafting-room being absolutely essential it cannot be dispensed with, but it can be and is made most disagreeable for the draftsmen in a great many places. Drafting should be considered as an overhead expense and not as labor at so much per hour on each contract. I do not mean to say that the draftsman's time should not be charged up to each job, for it should, but that drafting should be considered with the same dignity as engineering, which it properly is. Until drafting is thought of as engineering and engineering is raised to its proper place as the "noblest of professions" the draftsman has little hope of bettering his condition.

A comparison of the equipment of the average drafting-room with other offices is sometimes amusing. A bank, for example, invariably has a magnificent building, marble walls and ceilings, elaborate metal work and burglar-proof vaults, mahogany furniture, splendid rugs, etc., and yet at many of them same mahogany desks are clerks which could be replaced by any intelligent boy with a few weeks' training. The insurance companies are similarly outfitted and both savor much of that old fable about the spider and the fly. State and Federal offices are frequently fitted out with thousands of dollars worth of furniture and decorations with only a few political ward-healers to occupy them. Large corporations invariably have offices well furnished and equipped.

Consider now the drafting-room even in these same corporations. All too often it is a crowded, poorly lighted, dirty and dingy room. The furniture for each man consists of one table @ \$7.50 and one stool @ \$1.25, total \$8.75 — normal price. The chief draftsman's desk is about on a par with the rest of the office. A comfortable

stool is almost an unheard-of luxury in a drafting-room though they are on the market and sometimes furnished to book-keepers. Carpets or rugs are even more of a luxury but they are furnished for the clerks in the outer office. To furnish good tables, stools, lockers, T-squares, and instruments which go to make the draftsman's work more efficient and agreeable seldom seems to enter the heads of the management. For one class of work a drafting machine would pay for itself in a few months. Again in other cases parallel rules, a set of special curves, a good protractor, a pantagraph, a planimeter, or slide rule would save an incalculable amount of time. How seldom these things are considered!

LIGHTING. One would think that the lighting system of a drafting-room would receive first consideration and it probably would in a new plant built at the present time under competent engineers or architects. However it is a fact that there are hundreds of drafting-rooms which are not fit for a man to work in without artificial light or even with it, as at present installed. Experts on lighting are not consulted though there is ample advice which may be had gratis from the lighting companies and the manufacturers. The proper way is to call in an illumination engineer who is not interested in the sale of any particular kind of lamps. Draftsmen are not capable of judging the proper kind of lights, altho they may have strong opinions, because not one per cent of them ever worked under a correct form of illumination. It is not possible for me to say what is correct because experts aver that every room requires a special treatment. However I can state that one thing which draftsmen should **demand** is a proper lighting system. A light which is bright, not a spot light, but well diffused. Positively no shadows on the drawing for the eyes are constantly strained when trying to see a line with shadows cast over it. I know of one railroad which refused positively to put in drop lights instead of high ceiling lights in a room in which some fifteen draftsmen worked. Much of the work was tracing and ruinous to the eyes.

RULES. The rules in force in some of the various drafting-rooms would be amusing if they were not so tragic. It is amazing what freak traits of human nature are evidenced in their management. Frequently one is reminded of a school-room instead of a drafting-

room, then again of a machine shop, but seldom do the usual rules indicate that they are being applied to intelligent men.

A chief draftsman forbade his men to talk to each other except on business. One would infer that those guilty of breaking this rule would be "kept in" after five o'clock and made to figure weights. It is a frequent practice among chief draftsmen to gum-shoe around the room when they see two or more talking together, presumably to assist them in their work, but in fact, as all know, to find out if the talk was social or business. Why is it that so many men will sacrifice the respect of those under them by such petty, sleuthful tricks, when the information could be obtained so much easier and by more honorable methods?

Any workman will invariably detect a sleuth or a spotter and when a chief draftsman will so lower the standing of his position as to sneak around to watch the men, his attitude is going to be reflected back to him immediately with interest and the men will not only lose respect for him but will despise him as well.

USE OF TELEPHONES. Some chief draftsmen worry a lot over telephone calls which come to the men and resort to novel means to prevent them being called up during working hours. In fact it is not uncommon to prohibit the use of telephones to draftsmen while the clerical force are permitted unlimited use. I recall a case in which the chief draftsman "listened in" on a phone conversation and was rewarded by hearing one of his men condemning certain conditions under which he had to work. He was promptly discharged. A capable manager first investigates the conditions, then corrects them so his men will remain. At another place a chief was known to represent himself to be the draftsman wanted in hopes of catching information,—say, in regard to a man securing another position. Then if such were the case, the draftsman was fired because he dared to want another position.

HANDLING SUPPLIES. Rules for handling supplies are sometimes quite complicated and must have necessitated deep thought in their creation. For instance in order to get a new pencil one must return the stub of the old one and said stub must be under a certain established length. Others take the name of the draftsman each time a pencil or eraser is procured. A small set of books is kept, accu-

rately recording the supplies of each man and how the office boy, who is usually in charge of supplies, delights to tell the draftsmen they are using too many pencils. It has always been a mystery to me how authority could be so perverted as to put the draftsmen in positions subservient to the clerks and even the office boy, but such is too often the case. One man in particular, a designer of a hundred million dollars worth of steel structures, has to quibble with a clerk for his pens and pencils.

Supplies should be in charge of one of the responsible men but they should be dealt out freely. A man should be furnished with all the pens, pencils, etc., that he needs and even special instruments should be provided for individuals or for the general use of the office if there is need for them. They pay for themselves many times over and tend to make a workman more contended. Standard books in line with the work of the office should be kept accessible, and also several technical papers for the men to read at off hours. Entirely too much incompetent designing is done, a fact showing the lack of common every day knowledge which could be found in standard works and current magazines.

Now if these supplies, comforts or accommodations for the men are being misused, then it is time to call to account the guilty ones, and not to consider all as criminals and treat them accordingly, as is the usual drafting-room method. An amazing lack of the knowledge of management is displayed by the manager who makes petty rules humiliating all his men when the rules should apply only to a few. To one with average intelligence and an average understanding of human nature, it should be little trouble to detect the man who was taking too many pencils or abusing other privileges. Many a drafting-room has been demoralized just because some chief draftsman was too stupid to know this simple fact.

SMOKING. In regard to smoking in the drafting-room there is only one thing to do: Prohibit it. The reason for prohibiting smoking should be not so much because it takes time from the work (for some will go out and smoke anyway), not because it is unhealthy or unsanitary, but simply because it is not right to compel even one man to work among others who smoke if it is objectionable to him. Of course, if all wish to reek in smoke it is a different thing, or if

only one or two occupy a room, the problem is an individual one. One chief draftsman has a rule which could have only been "designed" by a warped product of the drafting-room, stating that men must not smoke with this exception: "If the cigar or pipe has been lighted before the whistle blew the draftsman shall go to work, but may continue to smoke said pipe or cigar until it is sufficiently exhausted so that he may economically dispose of same." This is at least the substance of the rule. I presume long cigars were in demand, so that one could light up at 12:59 and smoke till about 3 o'clock in the afternoon.

TIME CLOCKS. Time clocks are an abomination in a drafting-room and a source of great dissatisfaction. Drafting-rooms may exist which claim to have success with time clocks and whose men seem quite contented to punch them morning, noon and night but an investigation of such places would surely reveal one or these two things, perhaps both: — Either the management was mistaken in thinking they had **men** in the drafting-room when instead they had only **boys**, — boys in intellect if not in years, boys who had never known anything but a sort of slavery, never worked among real men, never heard of a vacation with pay, never knew anything **but** a time clock existence; or else there was discontent and the management failed to find it.

It is a peculiar thing but a fact nevertheless, that unless a manager is wide awake and knows human nature, he will seldom discover the under current of opinion among his men until such time when it may break out openly. A manager who is handicapped with great self-esteem invariably makes this error because he creates a barrier between himself and his men which bars all intercourse. I once knew such a manager who even bragged about his 100% organization when in fact there was as times great dissatisfaction and low morale, due as is frequently the case, to a subordinate.

The argument for the time clock is that it facilitates the keeping of the time and acts as a check on the men. Granting however that it may assist somewhat in the work of a \$50 per month timekeeper, it is a deep humiliation to a draftsman and tends to place him on a plane with irresponsible workmen; it is an indication that the men are not considered honorable enough to turn in their own time cor-

rectly; it is an insult to a man's intelligence. One seldom thinks that what may be saved by a timekeeper is lost by the draftsman in telling his fellow workmen how much he likes to "punch a clock." Certainly the morale of the men is lowered by these devices, which means that much less work is accomplished.

PLACE MEN ON THEIR HONOR. The proper way to keep time is to have time cards which each man fills out himself according to the record desired for the paymaster and cost accountant. If men are placed on their honor almost all of them will be honorable, but if compelled to punch a clock (which means to them that the company does not consider them so), these very same men will find ways to beat the machine.

As to keeping check on the men, this can be done by the chief draftsman, chief engineer, or the person in charge in a very simple manner, namely for the one in authority to know his men. He should know his workmen; know if they are capable of good work and of telling the truth. If there is any suspicion that a man is not truthful or is without honor, then he should be watched and when found guilty, called to account. When I say a man should be watched I mean that it should be done in a very unobtrusive manner instead of employing means to find evidence which will convict the one whom it is desired to find guilty.

WIDER VISION NECESSARY. Tact is a wonderful thing, a wonderfully rare thing in the engineering profession. We do not mix sufficiently with business men. We do not take part in the things which, although foreign to engineering work, are essential to an acquaintance with the vagaries of human nature. Engineers live too much to themselves, particularly office engineers. This confinement tends to make men narrow minded and petty. Jealousy, spite work and all the little sins mortal man is heir to become magnified under close inspection. We must broaden out and look at the doughnut of Life instead of at the hole. Why do engineers stoop to such contemptible things as are frequently done? Because they start out by stooping over the drafting board. They strain over a worn-out scale. They squint at a begrimed slide rule. They curse over the fact that the union man gets more money than they do. They live and breathe this atmosphere until they absorb these qualities. They

become stooped and strained and discontented but under all there is a sincerity of purpose. There are no finer characters than the great, broad-minded engineers who have surmounted the minor details of the business and who now can get the proper perspective.

LOYALTY OF DRAFTSMEN. Draftsmen are almost without exception, loyal to their employers, submitting even to the crudest systems of management. The draftsman is a conscientious worker but a poor business man because his thoughts are bent on his work and not upon the almighty dollar, as are his employer's. It is only recently that he has been forced to think about the dollar because of the rapidly increasing demands on his purse. As necessity has awakened him to this fact he looks around and finds common day laborers earning (?) as much as he does. He finds skilled labor receiving six, eight and ten times as much. Is it any wonder there is unrest with the market price of brawn at \$50 and brains at \$5 per day? It is an actual fact that steel designers were getting about \$7 per day while steel rollers with the same company were getting \$52.50 per day. This is merely an interesting comparison to show the difference between an organized trade and un-organized profession.

INTOLERABLE CONDITIONS. There are some conditions which are intolerable and it is absolutely unnecessary that draftsmen submit to them any longer. One is discharging men on short notice. Thirty days is not too much time to give a man to enable him to secure other employment and it is up to the draftsmen to insist on getting it in order to reduce so far as possible the economic loss incurred in making a change. I have in mind the case of a man who, feeling he would be let out, secured the offer of another position. His company however told him they wanted him to stay, so he remained. In two weeks he was "laid off" without any previous notice. It is with considerable restraint that I do not mention the name of the company for it is a notorious one in its methods of treating men. The latest symptom of dementia shown by this same company is to allow one hour's pay bonus per week but if a man is one minute late he is docked for 15 minutes and loses his week's bonus in addition. In this same class was the method of paying a certain bonus on the number of sheets of drawing turned out without regard to the amount

of work on each sheet. This bright idea was installed by a company which desired to show Uncle Sam how fast they were turning out the ship plans. The company has since failed which seems like just retribution to the ones guilty of the unprincipled, not to say treasonable, work.

Chief draftsmen frequently hold positions on their seeming ability to get work out of the men and not on their qualifications as managers, as should be the case. Quite naturally in such places we find conditions which that type of man approves. Men are promoted because they are favorites with the chief and "take what he says." The office becomes undesirable from the standpoint of every man who has any self-respect. Likewise the company gets a bad name and is condemned whenever mentioned. The companies with such unenviable reputations are numerous and the day will certainly come when it will be realized. Draftsmen can hasten the day by informing themselves as to proper methods of conducting a drafting-room and then requesting that these methods be adopted. This will mean the advancement of the most competent.

The space allotted to draftsmen in some places is of very meagre dimensions, even tho space may not be expensive in that location. You will find in some drafting-rooms today the actual measurement of floor space allowed for each man, not including the table space, to be not more than twenty inches by four feet. No doubt being in jail has its disadvantages but the convict has commodious quarters compared to the average draftsman. If a company can not make sufficient profit out of its drafting-room to enable it to furnish the draftsman with proper accomodations such as lockers, towels, sanitation, ample room, good tables, with drawers, correct light, heat, pencils, pens, erasers, T-squares and paper, etc., it had better go out of business and let that company do the work which has an up-to-date management.

NEEDED CHANGES. We have progressed and the old things must pass away. The workman is everywhere demanding his share of the profits and benefits derived from his work. Draftsmen have a right to demand justice under this most welcome new regime. They need at least two weeks vacation each year. They need life insurance, sick insurance, job insurance, and it is perhaps best that

they receive sufficient pay to enable them to buy this rather than have it given to them. They need recognition of their services and higher pay. They need better management and they need to be better managers. They need an organization to get these things because under the intensive business methods and desire for increased production, it is evident that the needs of individuals are not supplied by charitable institutions.

MORALE. There exists at present in most drafting-rooms an extremely low morale, a lack of the esprit de corps. There is also considerable "soldiering." This does not at all contradict the statement made in regard to the loyalty of the draftsmen, but reflects on the management which permits these conditions to exist. The word, morale, has come into prominence during the war. Every one knows that if the morale of an army is low its capabilities are greatly diminished. Morale means about the same as esprit de corps and in plain words both indicate the interest in the work at hand. At any rate so far as the drafting-room is concerned, the interest in the work is the principle, as it were, which underlies all the problems regarding working conditions. Why do so many draftsmen want to get out of the drafting-rooms, even out of the engineering business? Why do they all want to take up farming? Because they have lost all interest in the work. Every young man is interested in drafting when he first takes it up. Why do they lose this interest? Simply because of the abominable conditions, only a few of which have been mentioned. I could fill a book with instances if it would do any good. Thousands of draftsmen have been made nervous and many physical wrecks. I have seen them driven to drink. I know of some who joined the I. W. W. I have heard them discuss Bolshevism, favorably too, as the only means of correcting the conditions. There are socialists in most every drafting-room. I know they have been told and by engineers, "to go form a union, then we can deal with you." And right there we get the meat of the cocoanut.

ENGINEERS RESPONSIBLE. It is the engineers, the men who style themselves the profession, who really are responsible for the draftsman's predicament. It is they who have tried to shove the draftsman out of the engineering profession and have actually made draftsmen, themselves, believe they do not belong there. This phrase,

"Oh! he is only a draftsman," is made a thousand times a day which naturally hits everyone doing drafting work. No amount of explaining can take the stigma off the designing draftsman and put it on the tracer. It is the most contemptible phrase in use today among engineers and not one who uses it ever looked in the dictionary to find out the correct definition of the word, engineer, which is, to state it again, "one engaged in engineering." It is slightly inferred that drafting is at the bottom of engineering. To this I agree. Drafting is precisely where one would expect to find the foundation of engineering — at the bottom.

THE REMEDY. It is evident that there are many things which go to create chaos in the drafting-rooms. It seems to be human nature to feel dissatisfied with one's own position in life, seeing only the thorns, while another's work seems to be all rosy. Now this dissatisfaction, coupled with discontent, amounts to discouragement and discouragement is the worst handicap to progress that a man can experience. It is purely a mental condition and should never be allowed to gain a foothold in consciousness. The only way to prevent it is to uproot every evil which has a tendency to cause a lack of interest in one's work. You can not make a man like his work, but you can make conditions agreeable so that he will like it and take an interest in it. To carry the proposition to its ultimate conclusion it is possible to have every man like his work provided the fundamental causes which make a man dislike it are discovered. It can not be done by adopting the strong arm methods of a union, by plunging the country into an I. W. W. or Bolshevik revolution, by anarchy, or blood shed, but it can be accomplished only by charitable and unselfish endeavor. Furthermore it is being done and a number of manufacturing plants are working in almost perfect harmony and with contented employees. **They are all coming to it.**

SIGNS OF PROGRESS. Drafting-rooms which are laboring with complicated systems of filing might profit by investigating such long established concerns as, for instance, the Baldwin Locomotive Works, of Philadelphia. Twenty years ago this company was using a method of handling drawings in their office and shops which would put to shame many that are in use today.

With a desire to lift the draftsman out of his limited sphere, the Chicago office of the Robins Conveying Belt Co., has established a class in art for its draftsmen. The class is held once a week and is given one hour's personal instruction at the Art Institute without charge. This is a long step in the right direction.

The bridge department of the Southern Railway, Washington, D. C., a number of years ago, recognized their draftsmen to the extent of giving them titles of "assistant engineers." Draftsmen on other railroads should ask for this recognition also.

The American Bridge Co., have in some of their plants adopted a commendable scheme for retaining draftsmen during dull times. It is by simply working shorter hours. When there is a decrease in the amount of work it is far better to distribute the loss among the whole force than to make a few suffer for it.

The Willys-Overland plant of Toledo and the Link Belt Co. of Philadelphia and Chicago may be taken as examples of offices equipped with drafting machines. All others not using these labor saving devices are certainly behind the times.



CHAPTER IV.
MANAGEMENT.



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MANAGEMENT.

LACK OF INFORMATION. Customary forms of management for drafting-rooms leave much to be desired. Little has been written on this subject, except as may have been intended to expose such unsatisfactory conditions as have already been mentioned. Engineers have been prolific in their books on industrial management, control system, production and scientific management, but the work shop of the engineer himself seems always to have been overlooked. The books on the principles of scientific management and efficiency are legion and so much has been said on these subjects that is unscientific and tends to cause inefficiency, that the terms have become odious to many people; particularly the word, efficiency, which will not in the next century be able to free itself from the general idea of its being something German. German efficiency is now perfectly understood to indicate the ultimate in human slavery, the suppression of all individuality for the attainment of a purpose, which was world supremacy. Sufficiency, not efficiency, was the real trouble with the Germans. This subject is recalled only as a warning that we do not fall into the same pit and in our desire to be proficient and more efficient, become instead, sufficient. Neither must we countenance any systems which prevent full development of the individual nor suppress his inventive and creative abilities.

EFFICIENCY vs. ECONOMY. In place of the obnoxious word, efficiency, I prefer to use the plain old-fashioned word, economy. It is good enough for our purpose and when we, as a nation, learn (as we did somewhat during the war) what economy is, then it will be time enough to talk about efficiency. As for scientific management we want that of course in the drafting-rooms, but not some foolish mortal's idea of what constitutes scientific management. Scientific must indicate something correct. It is therefore the highest development in, or the nearest to the correct form of, management that we desire.

SCIENTIFIC MANAGEMENT. In every problem in scientific management due credit should be given to the late Frederick W. Taylor, whose pioneer experiments in this field are of inestimable value. They are valuable because he discovered and established certain fundamental principles which have been the basis of all later studies along this line. In order that a machinist may do his work with the greatest degree of efficiency, Mr. Taylor found that there are twelve variable factors constituting a problem which has to be solved previous to starting an operation of metal cutting. All these factors pertain to the cutting of the material, the tools used or speed of machine, etc., and the machinist is considered a constant coefficient in all cases. Now the work of a draftsman and that of a machinist is entirely different. The difference comes in the machinist being a workman skilled in physical labor while a draftsman is one skilled chiefly in brain work and only to a certain extent in physical labor. This is contrary to the prevailing idea of a draftsman's work, but the fact remains that his work is almost entirely mental.

So when it comes to determining the efficiency of a draftsman's work we may have 1200 variable factors instead of 12 and as the mental capacity varies with each person we may have 1200 variables in each individual case. The mental efficiency of a man may depend upon most anything in his daily life or past experience, from what he had to eat for breakfast to what place he went to school. It is therefore practically impossible to gage a draftsman's economic standard in the same way by which that of a machinist's is obtained.

Furthermore the Taylor system is so dangerously near to making a man a human machine that it is out of place in a drafting-room. There is quite enough of this human machinery about now, built by "slave drivers." After all conditions are analyzed it will be seen that what the draftsmen really want, what every one wants, is a square deal. Ethics is a word which has come to indicate hypocrisy among engineers, but which if properly applied will not only solve the problem of working conditions but the one of proper management of drafting-rooms as well. Ethics is the principle of right action, square deal, justice. We want ethics **applied**.

ETHICS APPLIED. In order to apply ethics in the management of the drafting-room, an understanding of what is right is re-

quired, and a knowledge of how to apply this understanding as well. It is evident that better managers are needed, otherwise such unsatisfactory conditions would not exist. One reason for poor managers is because the salaries usually paid to chief draftsmen are not sufficient to get good managers. Another reason is that schools do not produce managers, nor is sufficient importance given to this work in engineering. At present it is most difficult if not actually impossible to obtain capable managers as chief draftsmen. Therefore they will have to be trained.

THE MANAGER OR CHIEF DRAFTSMAN. A manager should be broad-minded, capable, able to command respect and be above petty jealousies. He must use tact and discretion in handling the problems which come up. If he is a good manager his men will like as well as respect him. He must have no favorites. He must be free from the minor details and be accessible at all times to those in his charge. Many chief draftsmen seem to think that their most important work is looking after the mailing of blue prints instead of devoting their time to managing an office. The best test of any management is the fact that the employees like their work and respect the "boss."

It seems to be the usual thing, when discussing labor problems to entirely forget those who furnish the money which makes business possible. However the above test will stand for when men like their work and are interested in it there will be production and economy; hence it is a square deal for the men, the manager, and the company.

Drafting-rooms should have distinct lines of promotion and each man be made to understand just where his position in the organization is. The last man to be employed naturally is at the bottom of the ladder but this is no reason why he should not be promoted over the other men provided he has the qualifications. The injustice comes when one who obviously does not deserve it, is stepped over another. This happens when the manager plays favorites or when there is a stockholder's son who must be advanced. In any case it is poor judgement.

Drafting-room forces are usually divided into squads and in order to handle any amount of work it is necessary to divide the author-

ity as well as the responsibility. Ten men is sufficient number for one squad. Sometimes a chief draftsman assumes all the authority but is ever ready to shift the responsibility when errors occur. That there is gross mis-management no one can deny who has the slightest knowledge of conditions, but before complaining too much about the "chief," it might be well for every draftsman to ask himself, "Could I do any better?"

MISMANAGEMENT. It seems strange that in engineering offices careless and indifferent management exists where one would expect to find everything in mathematical order and precision. Recently I met a young engineer carrying a small grip. He told me he had to carry his drafting instruments home every night because there was no place in the office to leave them. This was in the office of one of the prominent engineers of the country. Thus in the home of efficiency we find the ultimate of inefficiency. Every office has its own model system of filing drawings and no two are alike. Most of them seem to be worked out with the idea of hiding drawings rather than filing them for future reference. Methods of making up the pay-roll are frequently even more complicated than the filing systems.

One o'clock closing on Saturday has always seemed to me a method of trying to get a day's work out of the men while giving them a half-holiday at the same time. If it is to be a half-holiday then the office should close at twelve o'clock, allowing men to get their lunch at the usual hour. Draftsmen rarely accomplish any work between twelve and one anyway. Holidays are similarly granted, with strings to them. The men are not notified in advance, therefore can make no plans and the holiday does them no good. The company loses their time and the men gain nothing.

These things are mentioned because they are positively unnecessary sources of discontent. Engineers mismanage their own affairs and the men under them because they are largely ignorant of systems of management which have proven to be correct or scientific in principle. There is now practically a standard wage for draftsmen although it is not uncommon to see one man perform 100% more work than the man by his side. To pay a worker in proportion to the work performed is a fundamental principle in scientific manage-

ment. Every one knows that unionism has stood for the standard wage as against scientific management. Therefore every engineer who has not helped to enforce this principle has been, on the other hand, supporting the standard of unions.

FOREIGNERS IN THE DRAFTING-ROOM. One other condition in the engineering field should be uncovered in all its shame, namely, the situation concerning foreigners or at least near-foreigners, un-Americans. A number of cases have come to my notice where foreign engineers, even enemies, have been given preference over Americans, preference to which no superior qualities entitled them. Two reasons may be given for this: first, that foreigners will work as a rule much cheaper and second, that a number of executive positions are held by foreign engineers. It does not seem possible that a loyal company would during the war allow its engineering department to delay the output of war work through the employment of disloyalists. Yet such was the case and in one instance it was not discovered until the work was several weeks behind. The method was of German simplicity. The draftsmen started to work on the roof of the building first.

Now all this may be criticised as being pessimistic; however one cannot take an optimistic view of the engineering field and ignore these undesirable conditions. They must be exposed and when completely exposed to view, they are partially destroyed. The fault lies with the management and the management must be so informed in no uncertain terms. **The work of drafting is too vitally important to be mismanaged.**

TRACING DRAWINGS. It is an open question whether or not it is advisable for every draftsman to completely finish and trace his own drawings. It is certainly true that this method would often be more economical, because of the tracer's many possible mistakes which have to be checked, changed and corrected; all taking time and costing more in the end, than if the drawing had been finished by the one who made it. Then again the detailer or designer is frequently able to outline his work in pencil and finish it in ink on the cloth at a great saving of time. In comparing the two ways, it will be found that the experienced man will trace his own work in one-half to one-fourth the time of the ordinary tracer; he will make

fewer mistakes and cause less time for checking and correcting. Since the tracer ordinarily earns about one-half to one-fourth the salary of the detailer, there is nothing saved when it takes him twice as long to make the tracing as it does the detailer, not to mention the other items. No iron-clad rule can be made in regard to the tracing of drawings because every office has its own peculiar conditions and requires special attention. There are lines of work where it is no doubt economical to have tracers to trace the drawings, but they should always be students or beginners.

CHECKING DRAWINGS. Great responsibility is frequently placed on the draftsman. Even the detailer should realize the importance attached to his work for even though it may be checked, the checking is only done to catch possible errors. Accuracy is the first consideration. Whether the mistake is overlooked or not, it was made by the detailer and therefore he is responsible for it. Of course the final responsibility of the work rests upon the one who last goes over it but no detailer should ever depend upon a checker to catch his mistakes. His drawing should be finished and correct as far as can be reasonably expected.

All glaring errors should be caught as well as any which would entail considerable expense. A detailer should always take time to look over his drawing before it leaves his hand and check the most important dimensions or the basic figures. This tends to eliminate at the start any prominent mistakes. He should also, especially if careless tracers are in vogue in his office, always compare his drawing with the tracing to see if all figures and lines are copied correctly.

This review work on the part of the detailer pays for itself. When it is not done (and this is more often the case than otherwise) it is the fault of the management. To rush work thru the drafting-room is very poor business. This review work may consume but a few minutes or perhaps an hour or more, but the idea is, that the drawing should go to the checker as nearly right as possible. It is permissible to "leave for the checker" only the things of minor importance such as the mere addition of figures. It is sometimes permissible to leave them for the templet maker or machinist or field engineer but only when there is harmony between these parties and they are in close proximity, such as in a very small shop.

Some checkers have a practice of falsely marking a figure on a drawing in order to see if the detailer is back-checking the drawing before making the changes. Permit no subterfuges to detect one's trustworthiness. Meet the situation face to face and not by sneak-thief methods.

It is impossible to fix hard and fast rules to govern drafting and draftsmen. All engineering as soon as it gets beyond the absolute mechanical formulae is a matter of judgement and experience. Therefore it becomes necessary to have men in charge of drafting-rooms who possess good judgement and have had broad experience.

I have suggested that the mechanical tracer, that is, the man or girl who has no desire or ambition or ability to progress in technical engineering, be eliminated. If this is done there will be left in the drafting-rooms only those who already possess or are acquiring a technical education. This will at once solve some of the problems of management.

TURNOVER. Probably the worst feature in the present management of drafting-rooms is the "labor turnover". It is appalling when the class of work is considered. The "turnover" indicates the frequency with which the force is turned over or replaced and it is not unusual to find places where there is 100% turnover, meaning that new men were employed during the year equal to the average number in the office throughout the year. There are hundreds of shops which will not permit such a high percentage even among the laborers and if it were to happen some officials would lose their jobs. Many times the turnover would be made a lot quicker except for the fact that the men knew of no better place to go so they remained.

The financial management evidently knows nothing about these conditions; if they did they surely would be looking for some higher-class chief engineers or chief draftsmen. A few figures will show why. Suppose an office with an average force of twenty men should lose during the year twenty men and employ twenty more. At a very minimum, it would cost that company \$100 to break in each new man, making a total of \$2000 per year. Now if the company would take this sum and add it to the \$2000 which it is throwing away on the chief draftsman it would have the sum of \$4000 which would be nearly sufficient to get a good manager. We need a better class of

men for chief draftsmen, — not the type who hold their positions thru their ability to drive men, but the kind who can get the work accomplished without driving them.

FOOLISH EFFICIENCY. Various absurd attempts have been made to introduce methods of efficiency (so called) in the drafting-rooms. The men responsible for these rules have the most casual acquaintance with the true principles of economic management and their limited knowledge does more damage than would absolute ignorance. Would anybody want to ride in a railroad train with a man in the cab who had never been over the road before and had only a "casual acquaintance" with the signals? It is the same with these self-sufficient individuals who tinker with problems of scientific management without an understanding of the fundamentals involved.

In my cub days I was employed in a drafting-room where all were forbidden to draw dotted lines in making the pencil drawings. A full line naturally can be made much quicker and saves time. As I remember in looking back at those engine designs, drawn all in full lines, and then think of the hours I used to spend trying to pick out of that mystic maze some part of the machine in order to make a shop detail, — well it was good training but doubtful economy.

Quite recently, I was informed of another concern which requires draftsmen to follow a similiar procedure: when making a long line with a T-square, say from left to right, in order to save any extra movements the T-square must be shifted to another position and a second line be drawn from right to left as the arm returns to the first position. I would not believe it possible for an engineer to give such a ridiculous order, if I did not know of other cases equally foolish.

THE SLIP-STICK TABOOED. In some railroad offices for instance the use of a slide rule or planimeter is not allowed in calculating cross sections. Let me explain to the uninitiated that a "cross section" in railroad parlance is simply a section of the road bed in a cut or on an embankment and the points of elevation are taken with the level, reading only to tenths of a foot, which is sufficiently accurate to answer all requirements. The object being to determine the cubic yards of material excavated or hauled. A planimeter is a

small instrument which will give the area of any regular or irregular surface by simply tracing the outline with a pointer. This can be done in a few seconds, whereas it takes many minutes or even hours to calculate the same area. Likewise the slide rule sometimes may be used to great advantage on this and other classes of work. The party who stated that the railroads could save a million dollars a day surely must have been familiar with common drafting-room practices, but the railroads do not seem to profit by the advice because there are scores of draftsmen at this time, still figuring "cross sections" long hand on the government valuation work. The situation is enough to discourage the invention of labor saving devices.

PHYSICAL AND MENTAL LABOR. The methods applied to laborers or skilled tradesmen will not do in scientific management of the drafting-room. We are dealing with an entirely different kind of work. Taylor, himself, says that in his law of physical labor the more stupid a man is, the more nearly the law is fulfilled, showing conclusively that as the work becomes all mental, the law is inapplicable. Of course time studies could be made of draftsmen and methods devised of doing the mechanical work with the least number of movements, and in the quickest time, but of what value would the results be? They would only apply to about 1/10 of the draftsman's work, while the 9/10 or the mental part is neglected. Where would be the economy in teaching a man how to save a fraction of a minute in the operation of drawing a line while he is so constituted that he loses hours in trying to decide where that line is to be placed?

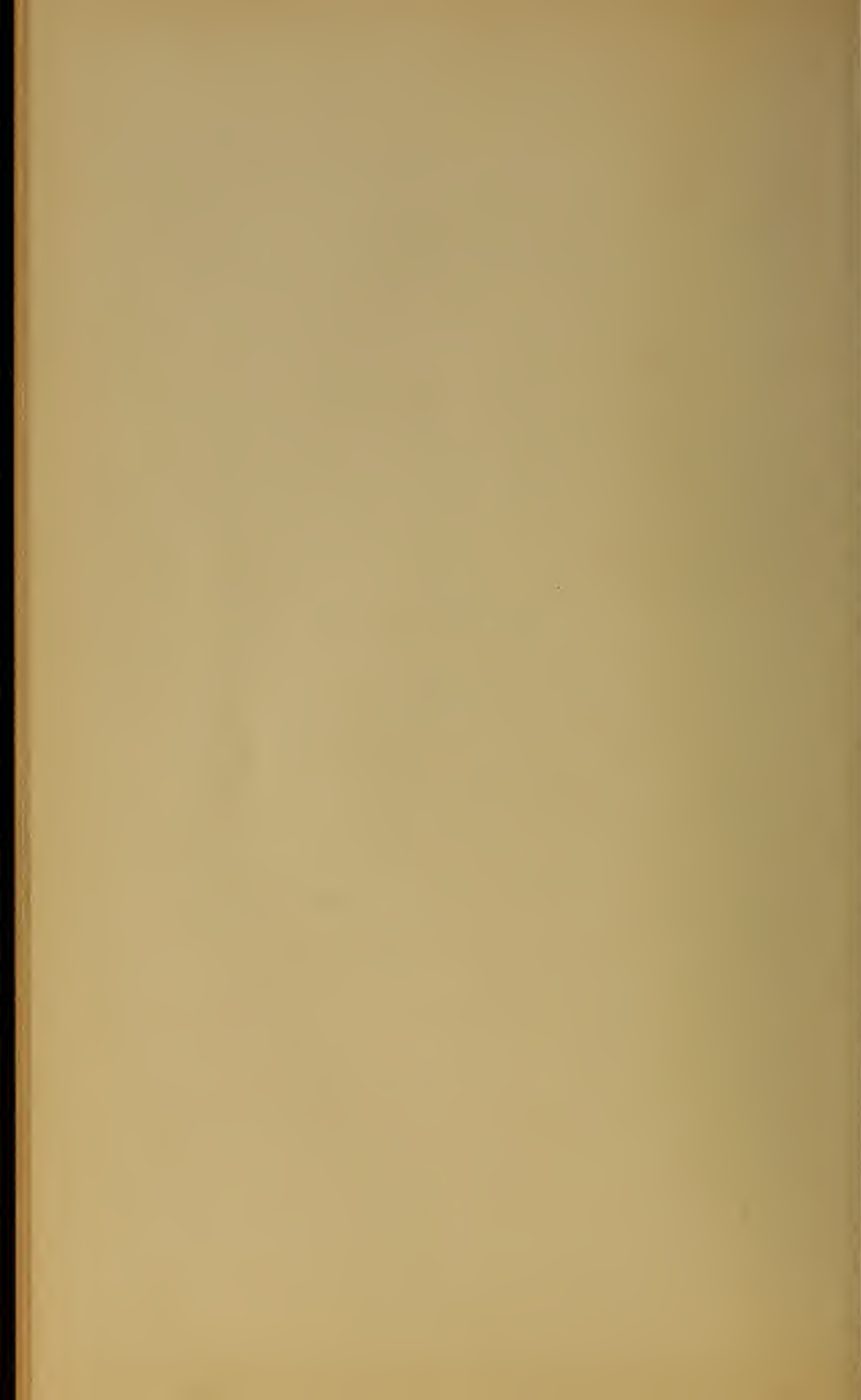
TIME STUDIES vs. WORK STUDIES. Valuable studies however can be made to determine if the work performed by the men is necessary or whether the best systems are being followed in performing it. For instance, I have a blue print of an ordinary structural drawing showing shop details of plate and angle work. The sheet is 36" by 42" and only comfortably full. By counting enough to estimate the balance, I found that there were some 2100 numerals, 800 letters and 1500 lines, not to mention inch marks, circles, dotted lines, cross hatching, etc., on this one sheet. A little well directed thought on the part of the draftsman would enable him to save some of these numerals, — perhaps 5% of them, but the drawing was well

made according to the practice of that office and all the numerals which could have been saved is a negative factor.

Now assume a new manager should look at this drawing. If he knows something about managing he would readily see that the great bulk of these 2100 numerals and 1500 lines were unnecessary and represented a great loss of time. A little cooperation between the drafting-room and shop would make it possible to draw such plans with about 20% of the effort required to make the one in question, transferring to the shop a little extra work.

This additional work thrown on the shop (which in this particular case would be the templet or pattern shop) is brain work. The templet maker would have to think a little more, becoming thereby, more interested in **his** work. He would not feel that the draftsman considers him an ignorant workman. With this greater interest in the work, comes a greater content. Being more contented, he turns out more work. "Greater production" is sounded constantly into the ears of workmen, sufficient to drive them to join the I. W(on't) W(orks), but how few there are who understand that increased production will never prove economical if the interest is thereby taken out of the work. The tendency should be to make men think about their work, not to have others do it all for them. This is why drafting is one of the most interesting of occupations, — it is all thinking, scheming, planning. Draftsmen lose interest in their work only after awakening to the fact that for years they have been exploited and have as a result become bankrupt and social inferiors. I have gone on record in the technical journals as stating that at present from 25% to 50% too much drafting is done. A change will come about gradually and when once the profession educates the public to the necessity, thousands of positions will open up which will demand the services of these men as engineers and managers.

CHAPTER V.
EMPLOYMENT.



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EMPLOYMENT.

TEMPORARY NATURE OF DRAFTING. Owing to the temporary nature of their work, draftsmen are compelled to change positions more or less frequently. No general statement applies to all branches of engineering and altho there are many manufacturing plants which are able to keep their draftsmen on the pay-roll even during dull times, the majority are not. For instance, a construction company secures a contract requiring a large drafting force. The draftsmen are procured but when all the plans are completed, their work is finished. Unless the company obtains another contract at this time, it can hardly be expected to retain its employees indefinitely. Again if the concern is a manufacturing company with a steady business ordinarily it would be folly for it to keep a large drafting force over an extended period with no work for them. To these companies engaged in the uncertain business of engineering and contracting, which desire to give their employees just treatment, consideration is due for the many difficulties with which they have to contend.

DRAFTSMAN NOT DAY LABORERS. Companies need only to understand that draftsmen are not day laborers and that the responsibility of their work demands that they be given somewhat higher consideration. Now those employers of draftsmen who hire and fire men with no thought whatsoever for the responsibility of their work nor for the value of the service which they have rendered, should be accorded scant courtesy. Many times when a force of draftsmen is laid off the company could well afford to keep them employed in some way until another contract was secured. I know of a case where men were laid off one day and on the next day a new contract was secured by the company and they were asked to return. How ridiculous it is to conduct a business on such a short sighted policy.

TRAINING REQUIRED. It takes many months for a draftsman to become familiar with a line of work at a cost to the employer of several hundred dollars, and then the moment the work runs so short that this man's services can be dispensed with, he is laid off. No regrets are mentioned. No acknowledgement made for the good service rendered. No hope expressed that work would come in so that he might soon return. A dishonorable discharge, as it were, with the dishonor not on the man, however, but on the chief draftsman or chief engineer who possesses so little conscience, so little of that fraternal spirit which should exist between men in the same work. Yes, and so little knowledge of the proper way of handling men. It is astonishing that the financial heads of companies allow conditions like this to exist. They do exist, however, and all too frequently.

ORGANIZATION NECESSARY. If draftsmen were organized they could correct such a condition by informing the head of the company, the one who is responsible to the stockholders, that such a policy was both a losing one for his company and most unsatisfactory to the draftsman. Of course, employers are just as human, and just as stubborn, perhaps, as the rest of us, and when they cannot see a thing is right and just, sometimes it is necessary to force the issue in another way. An organization is essential because an individual can do practically nothing alone. A union is not necessary, that is to say, a union which advocates continual strikes and boycotts. However a national organization could with more or less publicity rectify any condition which was not right. There is nothing so distasteful to people in general as adverse publicity. In such cases the draftsmen would avoid that company as surely as if a boycott were declared, and it would not be long before the publicity would have an effect on the business of the company. So it is evident that draftsmen have all the power in the world if they but organize and chose to exercise it. Let us hope that it will always be exercised for good, and good only.

SEEKING EMPLOYMENT. Since draftsmen must change their positions rather frequently it behooves them to study ways and means of procuring new positions and to avoid the loss of in-

come so far as possible between positions. Draftsmen like most all engineers are poor salesmen, but selling their services is a very important matter. Here are a few points to observe when applying for a position by letter:

1. Have the letter typewritten. Use a printed letter head of your own if possible or of your present company. Do not use cheap looking paper.
2. Start the letter by commanding the attention of the reader and close, leaving him with the impression that he needs just such a man as you.
3. Make your letter short and to the point. Always tell the truth. Never state your present salary, — state your future salary.
4. Have a concise statement of your experience always on hand and up-to-date. This is a most valuable thing to send an employer and the most important selling point you have.

The above ideas convey only elementary advice but it is advice that is very badly needed by draftsmen. They are notoriously careless in these matters even when it is vitally important for them to secure work. Many good men have lost out because they lacked an understanding of these simple facts.

SAMPLE LETTER OF APPLICATION.

Chicago, Ill., Jan. 1, 1919.

The Lake Shore Steel Co.,
Gary, Ind.

Dear Sirs:-

Please consider my application for the position of structural draftsman advertised in the "Daily News".

My experience in this line has been varied and practical, a summary of which is enclosed on a separate sheet.

Inspection work and observation in the shops has given me a familiarity with outside methods and I feel competent to economically detail or design any ordinary steel structure, or to take charge of squad.

Trusting that you are paying the customary rates on this class of work for one of my experience, I will therefore expect a salary of \$4200 per year and will be available two weeks after acceptance.

Yours truly,

524 La Salle St.

JOHN JONES.

RECORD OF EXPERIENCE.

JOHN JONES, 524 La Salle St. Chicago, Ill.

Age 30. Married. American born.

Graduate ———-Technical High School.

3 years Civil Engineering at Univ. of Ill.

$\frac{1}{2}$ year rodman, C. B. & Q. Ry.

$1\frac{1}{2}$ years instrumentman on location and construction, C. M. & St. P. Ry.

3 years drafting. Details, layouts, designs and estimates on steel and concrete and general civil engineering. Occasional outside inspections. With H--- & H---. engineers and architects.

2 years drafting. Detailing and checking on bridges and buildings with ——— Bridge Co.

1 year in charge of squad about six men. Heavy bridge work. With same company.

8 years total practical experience.

THE EMPLOYER'S VIEWPOINT. When writing an application consider the position of an employer. He is a busy man. He receives many applications. His notice is attracted to a neat, typewritten page and if he finds the qualities there that he is looking for, why should he look further? He does not, and the other letters are "filed", which may mean filed in some places and the waste basket in others, but it amounts to the same thing to the man out of a position. It should not be very difficult for any draftsman to get his letter typewritten. It may incur a trifling expense but it is worth it. In fact it is to one's advantage to get advice on letter writing from experts, who can usually be found, as can typists, in the typewriter supply houses.

PROMISCUOUS LETTER WRITING. The promiscuous writing of letters to business concerns should be discouraged because it cheapens the profession. Chief engineers actually receive hundreds of applications of all kinds, not hundreds in a year, but sometimes hundreds in a week. Of course they are seldom seen by the chief, as a clerk or possibly the office boy, has a blanket order to answer them thus: "There are no positions open at present but we will file your application and notify you if anything turns up." Many an otherwise intelligent man has been buoyed up by such a false hope. In most cases these applications are filed and never referred to. When the company wants a draftsman the first one who comes along is employed, or if none appear, it will advertise.

It is almost a waste of time and effort to seek a position unless you have some clue to a vacancy or perhaps have a personal friend who will reply to your letter. Sometimes a suggestion can be found under "New Construction" in the engineering papers, then your letter can be stated thus: "I read in the — News that your company is about to start construction" etc. If a mutual friend can be found and his name used in the letter it will almost always bring a courteous reply. It may be a subterfuge but if the truth is stated it is permissible.

APPLICATION BLANKS. Application blanks present a problem with which it is hard to deal. They are undoubtedly a nuisance to every draftsman. Every company has its own forms and

applicants usually have to fill them out before receiving any consideration. The draftsman is at a disadvantage because he is the "beggar", so to speak, and can not be the "chooser".

On the whole an application form contains a great amount of useless information which no employer ever wants, reads or verifies, but they may require considerable time in filling out. If a man wishes to apply in a number of places he must go through the ordeal for each one. These blanks frequently have a column for salaries received in former positions. This is not a square deal for the applicant. Does any company ever tell its cost prices to a competitor? Do they ever divulge the inner secrets of their business to any one who may ask? Then what right has any employer to request a prospective employee to tell the very thing which he should keep secret, — i. e. — "salary in last position" or "present salary"? Why should this question be asked except for the purpose of taking advantage of the one seeking the position? My advice is never to lose this advantage but state your price and make it exactly what you think your services to be worth. It is a very common thing for draftsmen to ask for a salary much less than they are worth and sometimes less than the company is willing to pay. A company can hardly be expected to pay more than asked.

RECOMMENDATIONS. Recommendations are a farce nine times out of ten. Employers ask applicants to give recommendations or to name two or three past employers, professors or friends as references, largely because it is the customary thing to do. Now everybody knows that any young man can get one or a dozen to "recommend" him for a position and many, many times the recommender laughs up his sleeve at the joke on the prospective employer. Frequently the lad who was lowest in his class at college and whom the professor blushes to recommend, proves to be the very best kind of a workman while the head of the class cannot hold down a second-rate position.

Any man who has acquired some years of experience can likewise procure recommendations because it is seldom that an employer will state anything to the detriment of a former employee, and rightly so. Any such black mark on a man's record is almost im-

possible to efface and will discourage him if he really desires to become a better workman. I once knew a man who boasted of the ex-convict which he engaged. This man had charity, or love for his fellow man, in his heart. If a draftsman is discharged because of a serious mistake, it is no reason why he should be refused an opportunity to get along in another position. In fact if he profits by his mistake he will be a better man than before.

When the man to be employed is an executive, his record can easily be investigated by the interested party if the importance of the position warrants it. If however it be a draftsman who is to work in a subordinate position the man should be accepted and employed on his own word and without bothering a lot of busy executives, for references about which they know nothing and care less. If the chief draftsman is a competent manager he can tell in the course of a few days at the most whether the new man is capable or not. An incompetent chief may however, (I have seen it happen many times) allow a draftsman to work for weeks or months without any particular supervision, only to discover finally that his work was so full of errors that it all had to be done over.

ADVERTISEMENTS. In regard to answering advertisements for positions it is difficult to advise for there are all kinds of freaks employing draftsmen and a well written letter may go wide of the mark, whereas the "cheap" looking letter against which I have advised, may appeal to the limited bank roll of the concern advertising. Some will accept the applicant who offers to work for the lowest sum. Others will do just the opposite and take the one who asks the most, believing that they are thereby getting the best. The conditions will remain uncertain until engineering in general is raised to a higher plane.

Advertising under "situations wanted" is an excellent way to obtain a position when any answers to the ads are received. It gives the applicant a far greater advantage to have a company write first, in answer to an advertisement. Fifty letters written in answer to "help wanted" ads may not bring a single reply but one answer to a "situation wanted" ad may mean a position. Unfortunately a small percentage of the latter class of ads are ever answered. If it is a

dull period they are few indeed but in busy times undoubtedly many good positions are secured that way. Generally speaking the expense of advertising represents a considerable waste of money and effort. **If the same amount were invested in an organization which cared for the employment of its members it would be much more satisfactory for all concerned.** The employee would know where there was any chance whatever of securing work without writing letters or filling out applications or making personal interviews. The employer likewise would know where to find the class of men he wanted.

"JOB" HUNTING. One of the most pernicious habits of draftsmen when out of work, is to "go the rounds" of the engineering offices, asking, even begging, for a job. If there is a personal friend in the office, ask for him and find out if there is any prospect before calling on the chief draftsman. One on the inside can always give some idea of the conditions and if there is not some hint as to a possible vacancy it is very bad policy to interview the boss. The reason is this: draftsmen calling frequently on busy men about positions is an annoyance. It cheapens drafting. It actually keeps salaries down.

For instance, say 100 draftsmen are let out in a large city as is not an infrequent occurrence. They make a mad scramble for new positions. If there are 100 offices in the business district, each of the 100 men may call at each office in about a week's time. The case is not an extreme one, for there are times when ten men a day will call in one office, seeking positions. Naturally a chief draftsman becomes somewhat disgusted. Since he is apt to meet and talk with other chief draftsmen, each will compare notes about the "job-hunters" and the impression is exaggerated until they estimate 1000 men out of work, instead of 100.

Naturally also these chief draftsmen size up the men and perchance take one or two who are willing to work for about \$100 per month. It is useless to vent our wrath on either party because they are both lacking in moral stamina. Since men are so weak morally it is necessary that some form of organization compel them to live up to the ethical ideals of the best. It is for their good as well as for

the good of all. Some form of prices must be maintained to prevent this suicidal process.

RETAIN DRAFTSMEN IF POSSIBLE. Companies should make every effort to prevent the flooding of the market with draftsmen. However they will do so only, when they have wide awake managers who understand how costly it is to hire and fire men, or when pressure is brought to bear through an organization. Men can be put on part time if times are very dull and it is necessary to suffer some inconvenience. In this way they can keep the wolf from the door and save the expense of moving to a new place till times become better. Companies which deliberately lower the salaries of men while keeping them at work the same number of hours justly earn the contempt of their employees, except of course when economic conditions of the country change. They should endeavor to find work in neighboring plants, even of competitors if possible, for their draftsmen, with the idea in view of having them return when the time is propitious. Have an understanding that the men are "loaned" if is agreeable to the draftsmen.

SELLING SERVICES. I am not one who believes that technical men should sacrifice any considerable amount of time to the study of salesmanship in order to sell their services. If too much time is devoted to this, when one has no desire to become a salesman, then there is an economic loss. A certain amount of attention must be given to the business end of drafting but if the best degree of the engineering is to be obtained, efforts should be concentrated on this work and not upon acquiring positions by the science of salesmanship.

Therefore the positions and salaries of these men should be protected for the sake of their families if nothing else. It is advisable to read books on selling, and writing letters, etc., but do not neglect the technical papers and current articles in connection with the work. There must be an organization to handle the welfare and business matters. Dues paid into the organization will give the needed protection to draftsmen, provided they take sufficiently active part in it to see that it is run properly and not for the selfish interests of a few.

EMPLOYMENT AGENCIES. In the March, 1918 "Monad", the publication of the American Association of Engineers, appeared an article by the writer in which it was stated that **the employment agencies were taking more money out of the pockets of the engineers than was being paid into the big national engineering societies.** This statement has since been given nation-wide publicity in circulars and I have yet to hear of it being disputed. This sum if put into one national organization would solve the employment problem for all engineers.

The employment agencies are a cause of great humiliation to draftsmen. Men are compelled to go to the agencies at times when starvation stares them in the face. It is then the applicant learns of the crooked channels through which they operate. His eyes are opened to the fact that chief engineers and chief draftsmen hire only through such and such an agency; that engineers and others are reaping profits from the unfortunate who need work; and that when once they have dealt with an agency, they are continually pestered with new offers. Many have been fired in order that a chief could hire new victims. To suggest such a thing as split fees may be unethical, but not necessarily untruthful. The agencies are a disgrace to the profession but the profession had best ask itself, "Who is directly supporting them, the employee or the employer?"

It is wrong in principle for individuals to derive profit from those who happen to be out of work and the private engineering agencies must eventually go out of business. The Division of Engineering of the U. S. Employment Bureau has made an attempt to give free service to all technical men and has rendered valuable aid to the government and to the men during the war. The American Association of Engineers has developed a free employment service for its members, second only to the Government. Other engineering societies have likewise attempted to give service to their members. Neither these societies nor the Government will be able to effectively serve all draftsmen or all engineers until one agency has eliminated all the others through a survival of the fittest. There must be only one.

SUPPLY AND DEMAND. The demand for draftsmen during the war was beyond all precedent but nevertheless there was no

period in which the supply was not equal to the demand. The U. S. Employment Bureau states that the only exception to this fact was in a few specialized lines but reports indicated that the supply became inferior where the demand was the greatest. Every draftsman should note carefully that normally **there are too many in the drafting business.** Every young man who intends to follow engineering should know it also. Every school should note it, because there are more students in the engineering courses than ever before, particularly in those schools which give only a superficial engineering education but sufficient for them to take up drafting.

I have no intention of campaigning against the schools to reduce the supply of technical men. The proper way to correct the condition of over-supply is to create a larger demand. A technical education is a good foundation for any line of industrial occupation, and there are great opportunities in the field for the surplus draftsmen if they would only rise to the occasion. There are thousands of positions in the service of cities, states and federal government, which technical men should hold and they no doubt would if they displayed more interest in the civic affairs of the community in which they live. To get into politics is not saying that you have to sacrifice any principle of engineering ethics or even of your own religion. Politics is what we make it or what the crooks make of it when the best citizens refuse to vote or run for office.

UNETHICAL PRACTICES. There exists among some companies which employ draftsmen a practice that is most reprehensible and one that is becoming more and more unpopular. It is the practice of making agreements, probably unwritten ones, between companies or individuals not to hire men from each other. That is to say, a draftsman perfects all arrangements to make a change by which he hopes to better his position, when all at once the secret agreement comes into play and the deal is off. It is without doubt barring a man's progress and prevents him from improving his condition through individual effort. It is similiar in effect to a black list or a boycott and without a semblance of justice.

To say the practice is unethical to a draftsman who has been through such an experience is to receive a string of invectives a-

gainst the entire engineering profession in general and certain individuals in particular. Why? Because the profession is represented principally by the big national societies. These societies are strong for preaching about their ethical ideals and the dignity of the profession. But it is the individual engineers who are responsible for the above practice and they invariably belong to one or more of the big societies. If any think that this practice is obsolete I will say that some of the most powerful corporations in the U. S. are today exercising this and similar methods of keeping draftsmen — engineers — on the tread-mill and it is not confined wholly to the big electrical companies either.

Hire-and-fire methods are also abominable ones which are in vogue in many engineering offices and construction organizations. Companies are extremely particular regarding the experience and qualifications of the men they employ, but do not hesitate to unceremoniously discharge them the minute they cease to become a necessity.

No such thing as a "permanent" position exists and draftsmen should accept no discounted salary on the promise of one. Promises also are frequently made regarding future increases and various other inducements given to persuade draftsmen to accept positions when men are not very plentiful. Draftsmen should beware of these rash promises because they are only made by crafty managers who will not be over scrupulous in keeping them.



CHAPTER VI.
COMPENSATION.

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GREED FOR WEALTH. Money, money, money and more money. Higher pay, minimum wages, just compensation. It is a disease. From the ignorant laborer to the bloated plutocrat the cry is the same, — more money. When will mortals learn that money, or material wealth, never brings the happiness which the inner self really desires? Never till the Christ Truth enters the consciousness and heals this insane desire, this covetousness, this disease. Wealth positively does not bring either health or happiness. Both are mental conditions, therefore they cannot be dependent upon material money. If you have ever seen a real, old time darkey you will in a measure realize that health, happiness and poverty may dwell amicably together.

If this seems like a bit of a sermon it is a most important one and a factor in the settlement of wage disputes which is seldom ever taken into account. The tendency has been too often to make demands for higher pay without regard to the justice of the cause, to get it because some other trade got it. There is no principle behind this method. For instance if John earns more money than his older brother, this fact in itself is no reason for the older brother to make any disturbance about it. If an electrician makes more than a brick-layer it is no reason why the latter should demand higher pay. If a steel roller makes \$50 per day is it any reason why a yegg-man should make \$5000 in a night? If one draftsman in the office makes more than you do is that any reason why you should put on a grouch and make yourself miserable?

This is just what causes the misery and discontent, — coveting something which some one else has. If draftsmen want a just compensation it would be well to sit down and think these things over and reason the problem out scientifically. Every office must endeavor to grade the positions so that there will be no cause for

complaint about the inequality of salaries. It is a problem for the management, not the draftsman. Any draftsman who has brains enough to make a competent workman must have sufficient intelligence to bring him to the conclusion that right and reason will win, not eventually, but NOW. It won the greatest conflict in all history and it will win every time it is applied.

FACTORS OF COMPENSATION. The factors which must be considered in determining a just compensation are varied and innumerable. However the most important are given as follows:—

1. Educational training which is necessary in order to perform the given work.
2. Practical experience required in addition to the theoretical training.
3. Responsibility of the position in connection with the value and importance of the work.
4. Executive ability, or the possibility of becoming a future executive.
5. Accuracy, speed and all-around effective economy of the workman.
6. Length of time in the employer's service.
7. Potential value; that is, a draftsman may have minor duties but retained and paid as an emergency expert.
8. Character and personal appearance.
9. Period of time in which a man may do effective work.
10. Special qualifications.

No fixed rule can be given to determine the just compensation based on these conditions. Neither can the relative value of each point be established except in the specific cases. But a few figures will show that draftsmen have not been receiving their just dues.

EDUCATION. Like any other engineer a draftsman must have a technical education. He must get it either in college or spend an equal amount of time in home or night-school study. The educational training of the average college graduate represents an investment of about \$8000, when taking into account the cost of tui-

tion plus the lost earnings during the time at school. This figure is necessarily estimated because there is little reliable data on the subject. When statements are made that a college education costs one or two hundred or even one or two thousand dollars, it is absurd. If the student instead of preparing for college had at the age of sixteen taken up brick-laying he could have by the time of graduation easily averaged \$1000 per year income or earned a total of about \$7000. This sum represents an economic loss as our man has been a non-producer for about seven years. Now if this sum is not considered and added to the cost of his education it is penalizing him just that much over the tradesman. Some men may work their way thru or even earn a surplus over the cost of tuition but on the other hand many others will affirm that it cost them \$5000 and over. To say that an average college training in engineering represents an investment of \$8000 is not far from the truth.

EXPERIENCE. The practical experience required to do the most ordinary drafting, even good tracing, takes from one to two years. To become fairly competent in just one special branch of engineering takes three to four years. To become an all-around competent structural draftsman or machine draftsman takes from six to ten years. It is necessary for a draftsman to spend six months to a year in the shop or on construction, or at least to be where he can see his work constructed, before the experience can be called really practical. Since this experience must be in addition to educational work when it is evident that a draftsman will be twenty-eight or thirty years of age before he acquires the qualifications which go to make up a "first class draftsman". For this highly trained and specialized products of modern civilization, the actual pioneers of industrial advancement, the employer offers the munificent sum of \$25 or perhaps \$40 per week. Now with a steady income of \$2000 per annum a married man with a small family could by living very economically save perhaps \$480 per year which is just sufficient to pay 6 per cent interest on the initial investment of \$8000. **The principle remains unpaid.** Without considering any points other than educational training and experience a college training then, so far as drafting is concerned, is a total loss, because \$2000 is above the average draftsman's salary.

The draftsman however **must** have the theoretical training so if he does not go to college he must get it at night schools or by home study. Undoubtedly he can get it cheaper this way than he can in college. It may be that the colleges offer a broader education and the night schools a more practical one, but it is not my intention to discuss the advantages or disadvantages of either. The point I wish to bring out forcibly is; that the educational training, consisting of higher arithmetic, algebra, geometry, trigonometry, physis, mechanics, and special engineering, must be mastered and six to ten years practical experience acquired on top of this, before one may qualify for a position as a "thoroughly experienced draftsman" as the ads read. The employer makes the specifications and we must meet them. Now since the theory and practice must be acquired and at just a certain amount of effort, does it make very much difference where or how it is acquired? Is not the man who works all day and studies night after night year in and year out just as deserving of the reward of a better position as the one who goes to college?

TIME IN COLLEGE. This fact stands out that the night school or home study man can acquire his education at a net cost of a few hundred dollars at most while the education of the college graduate represents a cost to the nation if not to himself of about \$8000. If I may venture a humble opinion: it is too much. There is nothing regarding the fundamentals of engineering, being simply truth, that can not be obtained outside of the college or any other school. Educators tell us that certain studies are desirable to give finish and round out the college man's viewpoint. But do they think of the years of non-production right in the student's prime of life? Is it not somewhat out of the natural order of things to expect a man to produce nothing until well along in the twenties? Neither can he support a family under the present rate of engineering incomes for some years after he leaves college unless he borrows money.

INTENSE PRODUCTIVE AGE. We are now entering into an age of intense productive effort and the workman's wages (we hope, too, the draftsman's) are enormously increasing, not so much to meet the higher cost of living but to pay for the cost of living

higher and better. Then it is well for students in engineering to reduce the cost of education and get to producing something by the time they take on the full measure of citizenship. Get the fundamentals and cut out the non-essentials,—the latter may be studied at leisure. I cannot share the opinion of those who believe that the college gives polish. The man who does not acquire his polish or refinement under the home influence is not apt to get it at all. The college course must be cut down to fundamentals and reduced in time required. What is the sense of wasting three months in each year on a vacation? We need more vacations after the commencement and less before. The vacation as we know it now is only a relic of by-gone days when the students had to go home in the summer to help on the farm. It wasn't a vacation in those days, it was hard work.

I will not attempt then to establish a rate of pay for draftsmen in order to charge off the principle and interest on the \$8000 investment. But this training has a money value which must be reckoned with, regardless of where it was obtained, so to me **\$5000 seems a fair valuation**. I will leave it to my critics to dispute this sum.

ABILITY AND RESPONSIBILITY. The responsibility of the work at hand is a most important factor in considering the compensation of draftsmen. A man in charge of \$25000 worth of work should be rated higher than one in charge of \$250, that is, in theory. Actually this practice could not always be followed but the more responsible work should go to the man with the higher rate of pay. In detailing and checking, in all engineering in fact, accuracy is of first importance. But if accuracy is not reckoned with speed, the former may become so painfully acute that it would be uneconomical. If a draftsman should fall below a certain level in his degree of accuracy so as to be classed as careless, his career is doomed in this work and plowing would be far better for him. The incompetent must be weeded out or seek their level and the best men will rise above them.

All other things being equal, seniority should be given preference for if the older men, in point of service, are not so recognized then what hope have the younger ones? The effect is demoralizing. When a man is promoted over men older in the service it must be

for capabilities which are self-evident, in which case the older man will realize and respect the other fellow.

FORTY YEAR DEAD LINE. A point usually overlooked, (and there is little evidence that the others ever had much thought) in the matter of draftsmen's compensation is the period of time during which a man can find employment. Every one knows that if he is out of work at the age of forty he finds it almost impossible to locate a position unless there is a great demand in his line. Likewise a draftsman at this age even tho he has been with a company for some time usually finds that he is slipping down hill or losing prestige about the office and the younger men getting the best work, — unless per contra he is sufficiently above the average to take the higher executive positions. In other words if a draftsman is not in an executive position at forty, and off the board, he is very likely to be ousted at the first opportunity. As only approximately ten per cent can ever become executives, such as being in charge of squads or departments or chief, then we have the fact facing every draftsman that he must prove to be the one in ten or he is apt to find himself walking the streets at forty or perhaps forty-five.

Now there is just one solution to this distressing problem. It is that the rank and file or the ninety per cent must receive sufficient compensation during the ten years between the ages of thirty and forty to pay off the initial investment of \$5000; to enable them to live in circumstances commensurate with the position; and to provide for the years after forty. It is an unusual way to look at it, you will say, but ask any draftsman in the forties, one who has done good work and is still able to do it, but fell at the forty year dead line. After sacrificing every thing for the love of engineering, he has to get along with a "job" now and then, sometimes at \$150 and sometimes it is only \$80. He knows. He can tell you how it is. Every young man should know NOW what he knows; then more of them will take up farming first, instead of afterward. Get out of the drafting-room before you are thirty or else see that your compensation between thirty and forty is sufficient to stretch over the future years of reduced income. They don't want you after that. I know many draftsmen but of the few past forty scarcely any are earning a decent living at the board. It is quite possible that

in time a change will come about regarding the age limit of draftsmen as well as other workmen. While some men begin to deteriorate at forty it is by no means true of all of them. There is no reason whatever for them to decline at forty or even sixty provided they have lived orderly lives and have not had to work under the unsatisfactory conditions which wear away body and soul.

BASIC PRINCIPLES. The writer assisted in formulating a set of principles on which to base a schedule of rates for various grades of engineers. It is, I believe, the first attempt to create any such set of standards and the majority of engineers look with horror on the very idea, even though many of them are unable to buy two suits of clothes a year on their present income simply because they refuse to work together or to organize. This set of principles is given with slight changes as it was originally reported to the Chicago Chapter of the American Association of Engineers.

Every draftsman should study them carefully because they contain the essence of the whole intricate problem of wage adjustment. If all disputes are settled thru cooperation and if every draftsman demonstrates his ability to perform service, just compensation will be granted and permanently established. **Draftsmen never have made a united effort to show the employer or the public the value of their work.**

SEVEN FUNDAMENTAL PRINCIPLES.

1. That the profession of engineering, taken as a whole, is insufficiently paid, or is not paid in proportion to the high degree of responsibility entailed or the technical training required to perform the work.

2. That the principle of a square deal for everybody should underly all rules of compensation, and that technical men must demonstrate their worth both to their employers and to the public before they will receive the compensation due them.

3. That this demonstration should be made by individual salesmanship and by proper methods of publicity, to establish cooperation between employers and employees and to insure proper recognition of the services of the engineer by the public.

4. That while salesmanship may produce results in individual cases, it is necessary to operate collectively for the rank and file of

engineers and desirable that some form of grades for engineering services be adopted with a minimum rate of pay for each grade.

5. That any rates suggested shall not be maximum standards but rather indicate the rate of pay of anyone who can perform the work and that individual effort should be encouraged to the fullest extent and paid for accordingly.

6. That in the determination of a just compensation, consideration shall be given to the effort or cost of the educational training, the years and character of experience in the particular line, as well as total years of experience; length of time in the employer's service; character and personality: degree of efficiency, and special qualifications, permanency of the work and economic conditions.

7. That the uncontrolled law of supply and demand is not a just method by which to determine the compensation for valuable services. Therefore, steps should be taken to control its operation so that it may not become oppressive, especially in the lower grades of service.

STANDARDIZING CONDITIONS. It is important that working conditions be standardized to a certain extent so that the rate of pay recommended may apply to a uniform basis of operation. That is, if a salary of \$2400 per year is on a basis of eight hours per day, and if a company insists on their draftsmen working ten hours per day, then draftsmen should in turn insist on pay for two hours per day extra, plus extra for over-time,—other things being equal. It is much to be regretted that we have to follow in the footsteps of labor in this respect but when employing companies ask draftsmen to work over-time night after night with no extra rate of pay or when they demand the best college graduates and pay them \$60 per month it is time to set standards of working conditions. For these reasons I make specific recommendations for draftsmen to consider and adopt as they see fit.

1. That the hours of employment ordinarily do not exceed eight hours per day or forty-four hours per week.
2. That overtime be paid for at 50 per cent increase.
3. That positions of less than six months duration be classed as "temporary" and be rated at 20 per cent to 50 per cent higher than the minimum according to conditions.

4. That no one in charge of work shall receive less pay than any one for whose work he is responsible.
5. That not less than one day for each month employed during the year be granted for vacation, in addition to all national holidays.

Bonus and piece work systems, group insurance schemes etc., are sometimes good and sometimes quite the opposite. They are frequently camouflaged methods of keeping salaries down. For instance \$1000 insurance on the group plan costs a company a very little less than it does the individual. The insurance company makes the concession in order to get new names on its books to exploit for new investment insurance on which they make more money. Draftsmen are intelligent enough, or should be, to care for their own welfare, insurance and investments, and they would be better satisfied to have the compensation they are entitled to without strings. Since there is such wonderful development taking place in the management of industries it is most important that draftsmen keep in touch with the progress of events and see that tried and approved methods are adopted in the drafting-rooms. The course seems to be leading towards profit sharing schemes in which all employees share. It is quite possible they will have to share in the losses as well as the profits if the plan is to be a strictly cooperative one.

AVERAGE SCHEDULE. The following schedule of rates is given only to indicate in a general way the salary which an average draftsman should make and his bank balance at the end of each year:

AGE	SALARY	INDEBTEDNESS	SAVINGS	BALANCE
21	\$1500	\$5000	\$500	—\$4800
22	1800	4800	600	— 4488
23	2100	4488	700	— 4057
24	2400	4057	900	— 3400
25	2700	3400	1200	— 2404
26	3000	2404	1400	— 1148
27	3300	1148	1600	+ 383
28	3600	—	1800	+ 2206
29	3900	—	2100	+ 4438
30	4200	—	2400	+ 7104

(6% interest included.)

At the age of thirty the draftsman is credited with about \$7000 in the bank and from thirty to forty, even if his salary continues constant, he will be able to save an additional \$30000 more or less. If he started to work without the initial indebtedness of \$5000 then it would be still better and he would be all the more deserving if he had carved out his own education rather than have had it cut and dried for him. Now being an average draftsman and reaching the dead line of forty, he is able to continue the battle of life when the company decides that younger men must take his place. All connected with engineering must begin to think of the work of drafting in different terms than they ever did before. Salaries of \$5000 to \$6000 will take the place of \$2000 and \$3000 ones. Approximately one hundred per cent increase is only a fair request which every able draftsman should make. There is no class of men which is more deserving of it. They can save their salaries many times over for their companies if given proper supervision and greater responsibility for those competent.

OFFICE ORGANIZATION. I have outlined a tentative organization for an engineering office of fifty men with salaries based on an intimate knowledge of existing requirements and responsibilities of the average organization.

ORGANIZATION OF AN ENGINEERING OFFICE.

Salaries and ages about as follows:

1.	Chief engineer	40—50	\$12000
1.	Office “	35—45	9000
1.	Designing “	35—45	7200
1.	“ “	30—35	6000
1.	Estimating “	30—35	6000
4	Squad “	30—40	5200—6000
6	Engineers	35—40	4800—5200
8	“	30—35	4200—4800
10	“	25—30	2700—4200
9	“	20—25	1200—2700
5	“	18—20	1020—1200
3	“	16—18	900—1020

We will assume that a student graduates at twenty one, starts to work well grounded in the fundamentals of engineering and has sufficient practical experience in the art of drawing to be able to produce almost at once. His salary would be \$1500 per year to start. Increases, it will be noted, are at the uniform rate of \$300 per year for ten years, until the age of thirty, when an income is reached which enables a draftsman to save for his later years. If he does not seem to be able to develop properly within a year or so under proper supervision, his increases should cease. He then will understand that he is not suited to drafting and he should be placed elsewhere with the company. Between the ages of thirty and forty the increases will be much less except for the few men who are capable of taking on the responsibility of executives with titled positions. The line of succession and promotion must be well defined and understood by all. Note that there are no draftsmen in the organization.

Drafting, tracing, detailing, checking, estimating, designing, is the work of engineers and if the draftsmen ever hope to command respect commensurate with the dignity of their calling — engineering, — they must use no word denoting the positions except “engineer”.

THE TENDENCIES TO KEEP SALARIES DOWN. There are a number of things which tend to keep down the salaries of draftsmen. Some have been mentioned in other chapters but it will only accent then to repeat a few. “Going the rounds” looking for work, writing letters indiscriminately, in search of positions, speaking continually of “jobs” and “wages” and unsatisfactory working conditions. Rise above the conditions and talk of positions and salaries, and decent living. Think of the just compensation and not “more money or strikes”. Establish some schedule of prices and uphold it. Do not take any salary less than what you are worth.

UNION METHODS. The trade unions have long been active in securing higher wages and they have not always stood upon the order of their methods. Frequently they have been most destructive but no more so than the means which have been used against them. On the whole the unions, as typified by the American Federation of Labor, are a great and powerful constructive agency. The standard

wages they adopt is the simplest way to handle the situation and the labor leaders have not concerned themselves very much about the right or wrong of this detail but have allowed the other fellow to do the worrying. A change is coming about in union wage methods and even now considerable unrest exists among the better element in the unions, because they are forced to work to this standard wage, receiving the same pay as the low grade workman.

They are not content with this equality of wages, which paradoxical as it may seem, is not equal rights at all, for it is not just. Evidence of the fact that trades people are giving more intelligent consideration to the wage problem may be found in England and in some of the British possessions as well as in the United States. Laws are being passed requiring the payment of minimum wages for all classes so that they may at least live respectably. Union leaders have been talking about minimum wages, implying that a higher rate will have to be paid to those who do more work, and differing from the present standard scale which is virtually a maximum rate.

This is a most hopeful sign of the times because it means that labor, although not aware of it, is groping in the dark for scientific or engineering management. Engineers must be trained to determine who are the capable workmen and deserving of wages above the minimum.

So draftsmen who are joining the union can best help themselves and the other union men by assisting in bringing about this change from flat standard wages to minimum standards. The adoption of any sort of standard salaries for draftsmen is at best but a compromise between the union method and the individual method of selling services. The immediate aim is to stop the exploitation of draftsmen. To insist on a just compensation will certainly tend to create deeper respect for the work of drafting and both the compensation and the respect are now at low ebb.

CHAPTER VII.
ORGANIZATION.

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ORGANIZATION.

ORGANIZATION NECESSARY. Several times in this book and many times elsewhere I have said that draftsmen must have an organization. It is absolutely necessary. Practically nothing is accomplished in this age without an organization. In industry, in war, in peace in politics, and in religion, little is accomplished without organized effort. The working man has, to a large extent, come into his own thru his organizations, the unions. The trade unions are on the whole for a good purpose and are necessary at the present time as a protection to the laborers and tradesmen. They are also responsible for many evil deeds committed in an endeavor to right fancied or actual wrongs altho on the other hand they are probably guilty of no more crime than the "capitalists" have been in the past.

CAPITAL AND LABOR. It is not necessary to discuss capital and labor in dealing with our problem except to say that there is in reality only room for one class of people in the United States of America, and that the so-called classes are rapidly finding it out. One writer has said that there are 30000 companies which have some kind of welfare work established among their employees. A really deep and sincere effort is being made, by a large and growing number of industrial managers, to treat employees justly. There will undoubtedly be war in some form or other until human beings eliminate the desire to possess something which does not rightly belong to them. Selfishness is the chief sin which prevents us all from living in harmony. The proper place for the technical man is between Capital and Labor, directing and uniting both.

DRAFTSMEN'S UNIONS. Draftsmen have because of conditions already described, become easy prey for the unionizing movement. A number of unions have been formed and become affiliated with the American Federation of Labor, but just how many is not

easily ascertained. One cannot condemn draftsmen for joining unions when engineers themselves and others advise it. Consider such a case as the Engineering Department of the City of Chicago. When these engineers asked for an increase in the civil service rate, they were told by the Council Committee "to go form a union and demand the increase, otherwise it would not go thru." Can these men be censored for doing it; especially since the rates have not been increased in twenty-one years? Trade unions have, on the other hand, obtained increases time and again.

ENGINEERS' ADVICE. The only cause for engineers to advise draftsmen to join unions is ignorance of the fundamental causes of unrest. They know little about unions and less about organizations in general. Why do draftsmen join unions and what do they expect to gain? The underlying cause of unrest is the wrongs which have been inflicted upon draftsmen but the surface cause of the union tendencies is low salaries.

These wrongs may be summed up largely in the one great crime of the profession; **the humiliation of engineers by engineers.** Thousands of draftsmen, particularly the younger ones, are today working under most unsatisfactory conditions. If a man objects to them he is usually fired; therefore he seeks to unite his efforts in order to right his wrongs. "The union men are getting the money, so let's join the union", indicates the general thought or lack of thought. So draftsmen are thinking that the unions will get them more money and that this will make up for the other conditions.

THE MISCONCEPTION. Will the unions get the draftsmen more money? Very likely they will, but how much? Will an organization composed of laborers and tradesmen work very hard to get draftsmen more than they make themselves? I hardly think so and yet none will deny that the class of work is deserving of better compensation than that of the tradesmen, generally speaking. Then what about strikes? Will intelligent draftsman enjoy the idea of being called out by some walking delegate in support of a hod-carrier's demand for more money? I think not, but the possibility ought to be considered.

NOTHING GAINED. Draftsmen gain nothing by joining unions allied with the trades because they possess in themselves all

the power requisite to make demands or threats if they so desire in order to gain "more money", without allying with the trades to which they do not belong. In allying with the trades they only give away the power they possess and become the tools of the unions. The unions want draftsmen and are seeking other unorganized professions because it gives them more power. Power is what they want and it is just as well to curb their ambitions somewhat before they upset the economic balance of the country. So I repeat, — draftsmen gain nothing by joining a union; they relinquish what power they already possess; they give up their chance of advancement because union men as a rule are not apt to receive the promotions. They place themselves on a lower plane of intelligence and every one in his heart really considers those who are more intelligent as his superiors. The different degrees of intelligence should represent the only classes and every incentive and help given to those who desire to reach a higher class.

STANDARD WAGES. The unions have always stood for standard wages which while being a protection to the incompetent, is discouraging to the better class of workmen. Draftsmen have endeavored to get away from the standard wage which is a cause of much discontent and under which they are at present reluctantly working. Frequently draftsmen with widely different capabilities are compelled to work side by side at practically the same rate of pay. **One man can easily prove that he does twice the work of another but finds it absolutely impossible to get more than a few dollars per month higher pay.** The unions will not lift draftsmen out of this rut; but will only anchor them deeper in it.

ENGINEERING SOCIETIES. Most all of the several hundred engineering societies and clubs are open to draftsmen but the benefits derived are of a technical or educational nature and with a few exceptions the business and welfare side is entirely out of their line. In other words they are not real organizations from which the members receive any material benefits or protection such as a union or a business man's association offers.

A few societies furnish employment service in a desultory way and sometimes they attempt to have a license law passed. The

draftsmen gets precious little that he needs in return for the dues he pays and as for the educational advantages, they may be had without joining a society. Then again a draftsman unless he can show some engineering title other than "only a draftsman" is ignored in most engineering assemblies.

The writer will undoubtedly be severely critized for thus condemning the engineering societies but he is quite able to meet it with facts which will verify any statements made. The attitude which the engineers in general and the societies in particular hold toward draftsmen is a hypocritical one and most unjust. This condition is undergoing a change however which has been brought about by the efforts of the younger men, and what is true today may not be true tomorrow. The change will be for the better and will take into account the interests of the younger men. When the attitude does change every draftsman should join some society which is advancing technical knowledge.

AMERICAN ASSOCIATION OF ENGINEERS. There is one body in which can be found considerable hope for draftsmen, viz., the American Association of Engineers. The writer has been an active member of this Association since its inception and can say that it is organized on the right lines to meet the needs of the entire engineering field. Its objects "are to raise the standard of ethics of the engineering profession and to promote the economic and social welfare of engineers". It is strictly a business organization and technical subjects are left to the older societies. Draftsmen are admitted to membership in three grades and the qualifications for each grade are as follows:

"A Certified member must be a graduate engineer with two years' experience or he must have had seven years' experience, including three years in responsible charge of engineering work. Due credit is given for responsible drafting work.

A Junior member must be a graduate engineer or have one or more years' technical training and two years' practical engineering experience; or have five years' practical experience."

A candidate-Junior member shall have had one or more years' practical engineering experience or one or more years' training in a recognized technical engineering college."

It certainly is some improvement on the "holier-than-thou" attitude taken by the older engineering societies. It is only another short step to a realization that everyone engaged in technical engineering has the right to call himself an engineer.

This Association has carried on an aggressive campaign against the employment agencies and has established its own service bureau through which hundreds of draftsmen have received assistance. It has taken a decided stand for increased compensation for all technical men. It has entered a feeble protest against the unsatisfactory working conditions prevailing throughout the engineering field but this protest will undoubtedly become stronger as the organization grows. It has become interested in politics in a non-partisan way, a step which is most necessary for technical men to take. The reason government by the people has to a certain extent failed is because the better class of people fail in their civic duty.

In any organization of engineers or draftsmen, and I contend that they are as one, the fundamental principle must be unselfish, otherwise there will be an endless amount of discord and eventual destruction. This is not saying that the organization should not seek higher pay for draftsmen (which taken by itself, is selfish) but that the organization must not seek it unless the draftsmen are worth it. To fight for ones' just rights is not considered selfish. The organization must promote and support worthy objects and the members must give of their time to help in these things without asking something in return. "Virtue hath its own reward" and if one freely gives, he will certainly receive, else the Savior's words do not hold good today.

The back-bone of an organization is in its officers and careful judgment must be exercised in their selection. The real work is usually done in the various committees. In committee work the best method to pursue is probably to appoint one man as chairman and hold him responsible for the work assigned. He may select his own assistants as he sees fit. Center the responsibility in one person. If an organization is to succeed it must give good service to the members who support it, and every member must in turn support the activities of the organization. The employment bureau for

example will depend upon the individual members to furnish it with reports regarding vacancies and any other information necessary to a mutual benefit association. The funds to support a mutual employment bureau should properly be paid regularly as dues, which relieves the burden of having to pay for service when least able to do so, or in other words when out of work. Is it not clearly shown that to be successful any organization of technical men must include the entire profession? Otherwise there will not be unity of action nor effective purpose.

WASTEFUL HABITS. A few figures will suffice to show that money is being expended to no good purpose, sufficient to support an organization which would answer the needs of the entire engineering profession.

For instance the daily papers and technical magazines of the United States are carrying "Situation Wanted" ads to the value of approximately \$100,000 per year which sum is paid out of the meager salaries of the technical men.

Draftsmen are paying a considerable share of this as well the employment agency fees. The numerous local engineering clubs and societies provide another opening into which engineers are pouring an astonishing sum of money. Out of some three hundred engineering bodies there are but a very few which are doing any earthly good, either for their members or for the welfare of the community. Perhaps draftsmen are paying only a small percentage of these dues because they are "only draftsmen" and are not especially desirable, but the fact remains that engineers are wasting this money. It should be put to some good purpose and the most important thing is to build up an organization both for the commercial interests of the engineer and for the unselfish interests of benefiting the public.

A summary of this waste amounts to the enormous total of approximately \$1,000,000 per year as follows:—

Wasted in employment agencies fees	\$500,000
Wasted in want ads	100,000
Wasted in useless engineering societies	400,000

Total\$1,000,000

CHAPTER VIII.

PATENTS.

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PATENTS.

Almost every draftsman at some period in his life longs to invent an article or machine which is patentable. There seems to be a sort of honor attached to one who has invented a device and the patent papers are as a certificate of merit in acknowledgement of the so-called creation. It would be presuming to say that draftsmen take out the majority of patents granted. It is more likely that it is only a small percentage, but it is not presuming to say that they have invented a great many things which others got patented. Furthermore if the truth were known, I am of the opinion that there is a very small percentage of all the patented inventions which were not either invented, improved or developed by draftsmen, not to mention the making of the patent drawings. It is seldom that the draftsman ever profits by his inventive skill or genius: almost invariably it seems that some one with more business ability and less principle relieves him of the burden of wealth. For this reason it is most vital that the draftsman becomes familiar with the best method of procedure when he reaches that stage of his career wherein it seems that he must invent something.

Nothing should be done to discourage our creative geniuses, nor do I wish to do so, but if the young men would only observe the very simple rules regarding the obtaining of patents and learn what a patent is and the value of it, then they would save themselves much time, trouble and expense. They will also prevent any incompetent or unscrupulous patent sharks, who prey on just such unsophisticated youths, from obtaining a means of livelihood, and there will be less "paper" patents, (i. e. patents with worthless claims) by many thousands. Every one with a new idea is shy and suspicious that it will be stolen. This is wrong because it in turn arouses a suspicious interest which invites the very disaster the inventor is trying to avoid.

Never keep the idea secret for this reason: If some one, unknown, should steal it and take out a patent claiming it as his own, you have absolutely no chance to realize on your invention because no proof exists, that is, no witnesses to testify, that you are the lawful inventor. Even if another actually invents the same thing and gets it patented while you are "keeping yours secret" he becomes the patentee in the eyes of the law. If you have made a sketch of your idea or invention and have it witnessed and dated, then you can prove your claim according to its date. In making a sketch or description of the idea, have one or more relatives or friends each write on it, "I understand this invention", then sign it and give the date. Make them understand it if you can. Preserve this paper and if your friends can be trusted to verify their signatures, it will hold perfectly good in court, even tho another patents the same thing and establishes a business on the invention.

Keep a complete chronological record of all development work and study because it may be necessary to prove that "diligence" or continued effort has been proceeding. Keep a file of letters received and carbon copies on the same kind of letter head as the letter sent out. If any machine is built, have its operation witnessed and record the names of at least some of the witnesses and dates. Proof, proof, proof is what a court requires if perchance the case is ever taken to court, but if all these precautions were taken fewer cases would ever get into court. In case of any supposed interference the case must be filed as soon as possible. Never make a joint application for a patent or own one jointly with another if it is possible to avoid it. The main reason is that when two own a patent jointly, either one may sell or manufacture the article regardless of the wishes of the other, unless very particular care is excercised in drawing up agreements, all of which is an endless source of trouble and expense.

Bear in mind that if an article is on the market for two years or more no valid patent can be issued covering it thereafter. When a draftsman makes an invention in line with his work there are certain rights which he has, provided he does not previously sign over all such rights to his employers. This is a legitimate procedure for an employer to take to protect himself. If he is employing men to

develop or invent machines or processes for him, he has a right to insist that they agree to assign them when they materialize. On the other hand when a draftsman is employed to do a regular line of work and then perchance discovers an improvement which is valuable or patentable he has a perfect right to realize on his discovery. The precautions necessary are that he must not do any of the development in the office or at any time when the employer has a claim on his time. Hence proof must be obtained of this during any period of development. If the invention is protected in this way then by far the best thing to do is to take it up with the employer who will be more than apt to duly recompense the inventor. In one case \$100 cash would represent a sufficient reward, then again, \$10,000 would not be too much. If the invention must needs be tried out then it is only fair that the inventor and his employer co-operate, each realizing the proper value of the efforts of the other.

Probably the greatest mistake, or rather misunderstanding, is in regard to the value of a patent. Many patents are not worth the sealing wax on them. Even some in which millions of dollars have been invested. Why? Because the claims have never been tested in court, and the value of a patent depends upon the validity and scope of the claims. When Uncle Sam grants a patent, all he says is this, "I have examined my records and so far as I can find you are the original inventor of this device and so I take great pleasure in issuing you patent papers on which you will see my great seal, and attached is a beautiful piece of red ribbon." Sam is a good old fellow but very careless with his diplomas. He doesn't give you a word of warning about the thousand and one pitfalls which are in your pathway nor does he offer much assistance when you fall into one, because he is too busy issuing patent papers to others. Every inventor should understand that his patent, even when granted with Uncle Sam's signature, is not a guarantee that the claims are valid until they are tried in the courts. It is evident that since Uncle Sam shifts the responsibility to the patent attorney it becomes highly important that the attorney presents such claims to the best of his ability. It is his job and not Uncle Sam's, and if he is competent the case is less liable to get into court. To throw the patent into litigation is a costly procedure and one which unfortunately the

average inventor has little chance of winning against a corporation with unlimited means. Our patent laws are not so unsatisfactory as our courts which are often inexperienced or incompetent to decide the technical questions arising.

It might be said right here that frequently the greatest protection which a patent gives one is that the public in general is ignorant of the fact that a patent grants so little. Altho I condemn certain legal procedure, the established laws however, and even customs, can not be revised in a day, so I advise every one who has an idea which he thinks is of value, to seek a patent attorney. As soon as the idea is in such shape to present, look for a reputable attorney, not one who advertises all kinds of inducements and benefits, but one if possible who comes well recommended and whose reputation is beyond question. See him personally if possible, and ask him if he thinks the idea is patentable. The answer may be "No", in which case all expense is saved. If the attorney cannot tell offhand that that the idea is not patentable he will advise a preliminary search for similar ideas which have been patented. The cost of this will be ordinarily about \$10.00. Copies can be had of similar patented ideas for a few cents apiece and every inventor should procure them before proceeding with his own, for he will frequently find that some one else has entirely covered the ground. If a library is handy where the Patent Record is on file, one may find valuable information himself regarding similar ideas and possibly save all further search and endeavor. However unless one is familiar with patent procedure it is always best to consult an attorney, but do not look for the cheapest one to be had. Cheap professional service is poor economy.

It is undoubtedly a joy to feel that you have created or invented something which no one in the whole world, past or present, ever thought of before and I hesitate to take this joy out of any one's life. However it is far better to get down on the earth at once than to go through long months or years of tinkering and experimenting, becoming so absorbed in the work that you get into a disagreeable, unreasoning, melancholy state which is only a mild form of insanity. This is why inventors have the reputation of being more or less crazy, because the condition has grown on them and they get

so impregnated with the belief that their own idea is going to revolutionize industry and is worth billions, that it is well nigh impossible to reason with them. So avoid this condition by seeking the advice and confidence of others, particularly a competent patent attorney.

After finding out that the idea is patentable it is advisable to obtain if possible some knowledge about the salability of the patent. That is, it may be possible to determine at this time that even if the patent were procured it would not be practicable to manufacture the device. Perhaps it would be too costly to make and sell at a profit, or it might have no commercial worth at all.

Patents cost about \$100 (minimum) of which the government gets \$35. A draftsman is not able to save anything by making his own patent drawings unless he has learned how they must be made, then it is a matter between him and his attorney. After a thorough search is made and the attorney advises that he thinks a patent may be secured, bear in mind that he can never give you an absolutely positive answer in the matter. Consult the attorney on the possibility of having the claims of the patent granted and the advisability of proceeding. Remember tho, it is his business to get patents as well as advise, and he could not reasonably be expected to discourage an inventor when there was one chance in a thousand of obtaining a patent for him. The inventor must decide for himself whether he wants the patent or not, how badly he wants it and how much money he is willing to spend to get it.

Now, after a patent is obtained, comes the hardest part of all, — that of realizing on the investment. It is safe to say that no one will ever be found who believes in the invention to the same extent as the inventor. Before an individual or a corporation agrees to manufacture a device, they want to be reasonably sure of a profit on their investment. The average inventor is most unreasonable in his demands which in turn discourages the right type of manufacturer, throwing the inventor into the hands of the unscrupulous, who immediately proceed to fleece the unwary inventor by promising great things for him but performing little and that illegally. The next thing the inventor knows is bankruptcy and some one else in unhampered possession of his invention.

The inventor must beware also of granting the exclusive rights to manufacture on a royalty basis without stipulating a certain minimum output, because there are thousands of inventions now locked up in the vaults of corporations which will never see the light of day because of omitting this clause. It is much more desirable at times for a corporation to prevent an article from being manufactured even tho the patent has to be bought at a considerable sum, than to manufacture it. The reason is that it entails a large expense to change over to the new device, so they prefer to go along in the old established rut.

We pride ourselves on the inventive genius of the American people and how little the people in general realize that there are numerous inventions perfected today which if put on the market would revolutionize many lines of industry. This statement is not based on hearsay but on actual knowledge of a score of inventions which are unknown except to a few, because the inventor is so unreasonable in his demands that manufacturers will not deal with him, or because a corporation is able to prevent the manufacture either by controlling the invention under contract or by monopolizing the entire field in that line. In this nefarious work we can take no pride.

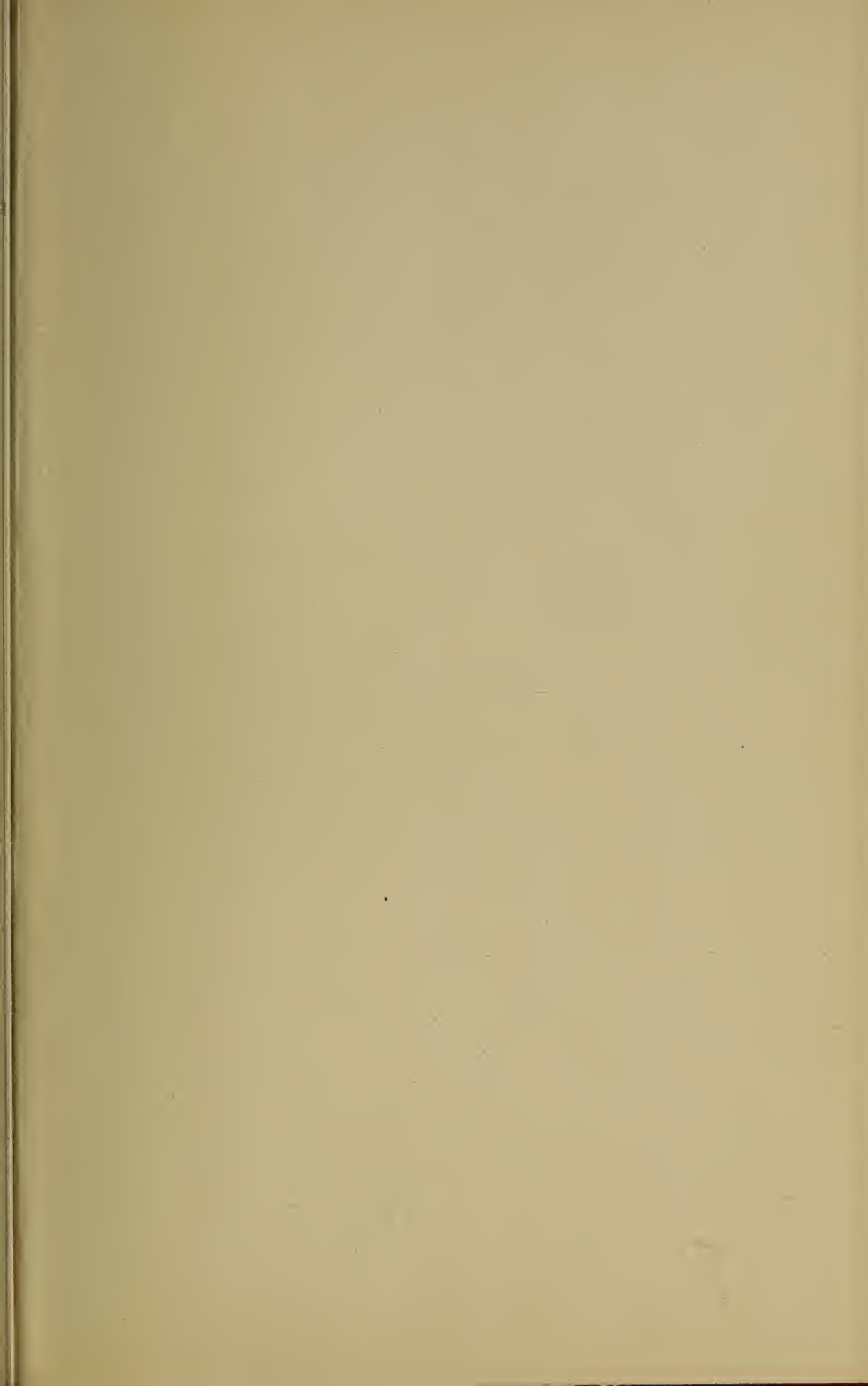
Inventors,—“Watch your step.”

It is a fact that America has produced many noted inventors who have had to go to a foreign country in order to receive appreciation for their discoveries. It is time for us to stop boasting of the things we do and take stock of the things we leave for others to do. One way to make things more encouraging for inventors would be to create a “Foundation,” to investigate and develop new inventions. The idea may sound impractical, but on second thought it is no more so than the great funds which are already created for the development of educational and medical research work. Why not a fund to develop inventions? It is easy to conceive of the difficulties in the way of this scheme but think of the possibilities. Think also of the humiliation which an American inventor must feel when he is driven to Europe to get money to develop his idea, — and this the richest nation in the world!

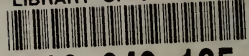








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